Modbus/TCP Communications Options Module

M/N VT-COMM-MTCP
FRN 1.xxx

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at **http://www.rockwellautomation.com/vtac**) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

Shock Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that dangerous voltage may be present.

Burn Hazard labels may be located on or inside the equipment (e.g., drive or motor) to alert people that surfaces may be at dangerous temperatures.

Summary of Changes

This is the first release of the VT-COMM-MTCP Modbus/TCP Module User Manual.

Table of Contents

About This Manual

Related Documentation

For:	Refer to:	Publication
VTAC 9™ Drive	*VTAC 9 AC Drive User Manual*	9VT-UM001…
VS Utilities™	*VS Utilities Getting Results Manual* (and online help installed with the software)	D2-3488
EtherNet/IP	*EtherNet/IP Planning and Installation Manual* *EtherNet/IP Performance and Application Guide*	ENET-IN001… ENET-AP001…

Documentation can be obtained online at **http://www.vtacdrives.com**.

Rockwell Automation Support

If you have any questions or problems with the products described in this instruction manual, contact your local Rockwell Automation, Inc. authorized HVAC representative.

For technical assistance, please review the information in Chapter 5, Troubleshooting, first. Then check the VTAC drives web site (**http://www.vtacdrives.com**) for additional information. When you contact a Technical Support representative, you will be asked for the drive model number and this instruction manual number.

Conventions Used in This Manual

The following conventions are used throughout this manual:

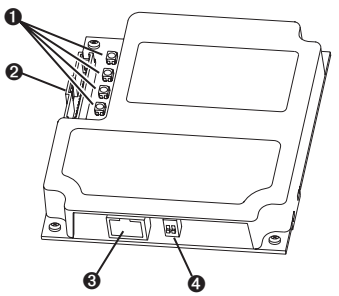
- Parameter names are shown in the format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name — for example, **Parameter 01 - [DPI Port]**.
- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read "Select **File > Open**," you should click the **File** menu and then click the **Open** command.
- The firmware release is displayed as FRN X.xxx. The "FRN" signifies Firmware Release Number. The "X" is the major release number. The "xxx" is the minor update number.
- This manual provides information about the Modbus/TCP Communications Options module and using it with VTAC 9 AC drives. The module can be used with other products that support a DPI™ module. Refer to the documentation for your product for specific information about how it works with the module.

Getting Started

The VT-COMM-MTCP module is a communication option intended for installation into a VTAC 9 drive.

Components

Figure 1.1 Components of the Module



Item	Part	Description
1	Status Indicators	Four LEDs that indicate the status of the network connection, DPI, and the module. Refer to Chapter 5, Troubleshooting.
2	DPI Connector	A 20-pin, single-row shrouded male header. An internal interface cable is connected to this connector and a connector on the drive.
3	Ethernet Connector	An RJ-45 connector for the Ethernet cable. The connector is CAT-5 compliant to ensure reliable data transfer on 100Base-TX Ethernet connections.
4	Web Pages Switch (SW2)	Enables or disables the module web pages. Refer to Setting the Web Pages Switch on page 2-2. SW1 is unused.

Features

The VT-COMM-MTCP Modbus/TCP module features include:

- Typical mounting in a VTAC 9 drive.
- Captive screws to secure and ground the module to the drive.
- Compatibility with various configuration tools to configure the module and connected drive. The tools include the LCD OIM (Operator Interface Module) on the drive and VS Utilities (version 3.01 or higher) drive-configuration software. In addition, you can use a BOOTP server to configure the network features on the module (for example, the IP address).
- Status indicators that report the status of the drive communications, the module, and network. They are visible when the drive cover is open or closed.
- Parameter-configurable I/O (Logic Command/Reference and up to four pairs of Datalinks) to meet application requirements.
- Support for a variety of Modbus/TCP function codes.
- User-defined fault actions to determine how the module and VTAC 9 drive respond to communication disruptions on the network and controllers in idle mode.
- Web pages, viewed using a web browser, that show information about the module, connected drive, and other DPI devices connected to the drive.
- Configurable e-mail messaging to desired addresses when selected drive faults occur and/or are cleared, and/or when the module takes a communication fault action.
- Support for DPI routing, enabling access to any networked VTAC 9 drive (with a VT-COMM-MTCP module) using VS Utilities (version 3.01 or higher) to monitor and configure that drive and its connected peripherals.

Compatible Products

The VT-COMM-MTCP Modbus/TCP Communications Options module is compatible with VTAC drives that support DPI. At the time of publication, compatible products include:

- VTAC 9 Drives

Required Equipment

Equipment Shipped with the Module

When you unpack the module, verify that the package includes:

- ❑ One VT-COMM-MTCP Modbus/TCP module
- ❑ A 2.54 cm (1 in.) and a 15.24 cm (6 in.) Internal Interface cable (only one cable is needed to connect the module to the drive)
- ❑ This manual

User-Supplied Equipment

To install and configure the module, you must supply:

- ❑ A small flathead screwdriver
- ❑ Ethernet cable (refer to the *EtherNet/IP Media Planning and Installation Manual*, Publication ENET-IN001…, for details)
- ❑ Configuration tool, such as:
  - LCD OIM
  - VS Utilities (version 3.01 or higher)
  - BOOTP Server (version 2.3 or higher) (network setup only)
  - Third-party network configuration software

Safety Precautions

Please read the following safety precautions carefully.

ATTENTION: Risk of injury or death exists. The VTAC 9 drive may contain high voltages that can cause injury or death. Remove all power from the drive, and then verify power has been removed before installing or removing a VT-COMM-MTCP module.

ATTENTION: Risk of injury or equipment damage exists. Only personnel familiar with drive and power products and the associated machinery should plan or implement the installation, start-up, configuration, and subsequent maintenance of the product using a VT-COMM-MTCP module. Failure to comply may result in injury and/or equipment damage.

ATTENTION: Risk of equipment damage exists. The VT-COMM-MTCP module contains ESD (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the module. If you are unfamiliar with static control procedures, refer to *Guarding Against Electrostatic Damage*, Publication 8000-4.5.2.

ATTENTION: Risk of injury or equipment damage exists. If the VT-COMM-MTCP module is transmitting control I/O to the drive, the drive may fault when you reset the module. Determine how your drive will respond before resetting a module.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 23 - [Comm Flt Action]** lets you determine the action of the VT-COMM-MTCP module and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

ATTENTION: Risk of injury or equipment damage exists. When a system is configured for the first time, there may be unintended or incorrect machine motion. Disconnect the motor from the machine or process during initial system testing.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 19 - [Msg I/O Timer]** lets you determine how long it will take the VT-COMM-MTCP module to detect network communication losses. By default, this parameter sets the timeout to five seconds. You can set it so that the duration is shorter, longer, or disabled. When set to disabled, this also disables module **Parameter 23 - [Comm Flt Action]**. Therefore, a communications fault action will be ignored. Take precautions to ensure that the setting does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

ATTENTION: Risk of injury or equipment damage exists. The examples in this publication are intended solely for purposes of example. There are many variables and requirements with any application. Rockwell Automation, Inc. does not assume responsibility or liability (to include intellectual property liability) for actual use of the examples shown in this publication.

ATTENTION: For security reasons, it is recommended to isolate the Modbus/TCP control network from the enterprise-wide Ethernet network. This can be accomplished by:

- Making the Modbus/TCP control network a stand-alone network.
- Placing a firewall between the Modbus/TCP control network and the enterprise-wide Ethernet network.

Quick Start

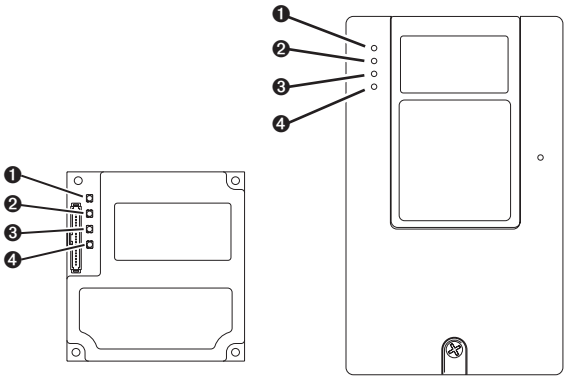
This section is provided to help experienced users quickly start using the VT-COMM-MTCP module. If you are unsure how to complete a step, refer to the referenced chapter.

Step	Action	Refer to...
1	**Review the safety precautions for the module.**	Throughout This Manual
2	**Verify that the VTAC 9 drive is properly installed.**	Drive User Manual
3	**Install the module.** Verify that the VTAC 9 drive is not powered. Then, connect the module to the network using an Ethernet cable and to the drive using the Internal Interface cable. Use the captive screws to secure and ground the module to the drive.	Chapter 2, Installing the Module
4	**Apply power to the module.** A. The module receives power from the drive. Verify that the module is installed correctly and then apply power to the drive. The status indicators should be green. If they flash red, there is a problem. Refer to Chapter 5, Troubleshooting. B. Configure/verify key drive parameters.	Chapter 2, Installing the Module
5	**Configure the module for your application.** Set module parameters for the following functions as required by your application: • IP address, subnet mask, and gateway address • Data rate • I/O configuration • Fault action	Chapter 3, Configuring the Module
6	**Set up the master device to communicate with the module.** Use a network tool to configure the master device on the Modbus/TCP network.	Instructions for your network tool

Status Indicators

The module uses four status indicators to report its operating status. They can be viewed on the module or through the drive cover (Figure 1.2).

Figure 1.2 Status Indicators (location on drive may vary)



Item	Module Status Indicator Name
❶	Drive
❷	MS
❸	NET A
❹	NET B

After installing the module and applying power to the drive, refer to Start-Up Status Indications on page 2-6 for possible start-up status indications and their descriptions.

Notes:

Installing the Module

This chapter provides instructions for installing the VT-COMM-MTCP module in a VTAC 9 drive.

Preparing for an Installation

Before installing the module:

- Read the *EtherNet/IP Performance and Application Guide* (Publication ENET-AP001…) and *EtherNet/IP Media Planning and Installation Manual* (Publication ENET-IN001…).
- Verify that you have all required equipment. Refer to Required Equipment on page 1-3.

Setting the Web Pages Switch

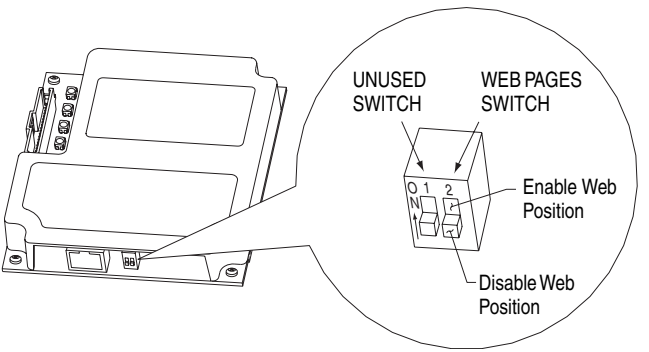
To use the module web pages, the Web Pages Switch must be set to its "Enable Web" position.

Important: A new switch setting is recognized only when power is applied to the module, or the module is reset. If you change a switch setting, cycle power or reset the module to apply the change.

ATTENTION: Risk of equipment damage exists. The module contains ESD (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the module. If you are unfamiliar with static control procedures, refer to *Guarding Against Electrostatic Damage*, Publication 8000-4.5.2.

Set the Web Pages Switch (SW2 in Figure 2.1) to enable or disable the module web pages. By default, the module web pages are disabled. For complete details on module web pages, see Viewing the Module's Web Pages on page 6-1.

Figure 2.1 Setting Web Pages Switch



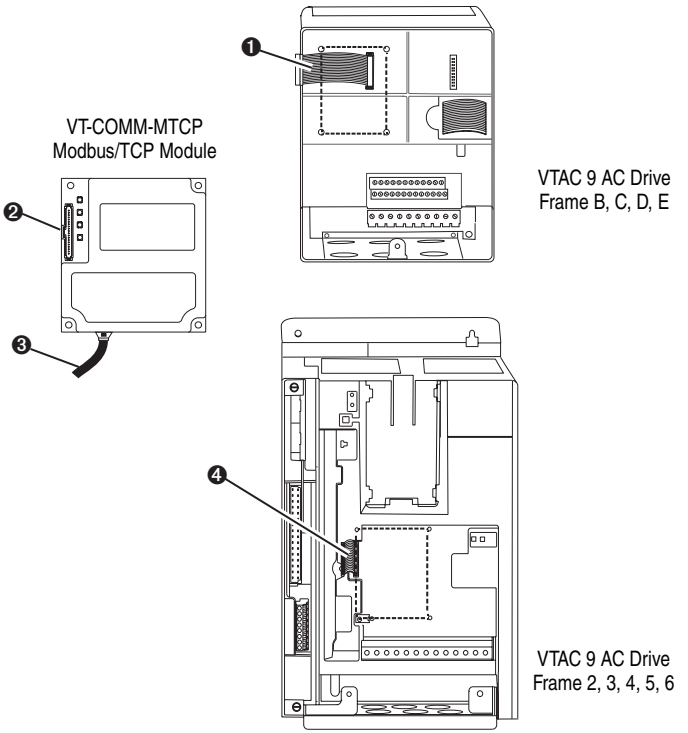
SW2 Setting	Description
Down (OFF) position	Disables the module web pages (default setting).
Up (ON) position	Enables the module web pages.

Connecting the Module to the Drive

ATTENTION: Risk of injury or death exists. The VTAC 9 drive may contain high voltages that can cause injury or death. Remove power from the drive, and then verify power has been discharged before installing or removing the module.

1. Remove power from the drive.
2. Use static control precautions.
3. Remove the drive cover or open the drive door.
4. Connect the Internal Interface cable to the DPI port on the drive and then to the DPI connector on the module.

Figure 2.2 DPI Ports and Internal Interface Cables



Item	Description
❶	15.24 cm (6 in.) Internal Interface cable
❷	DPI Connector

Item	Description
❸	Ethernet cable
❹	2.54 cm (1 in.) Internal Interface cable

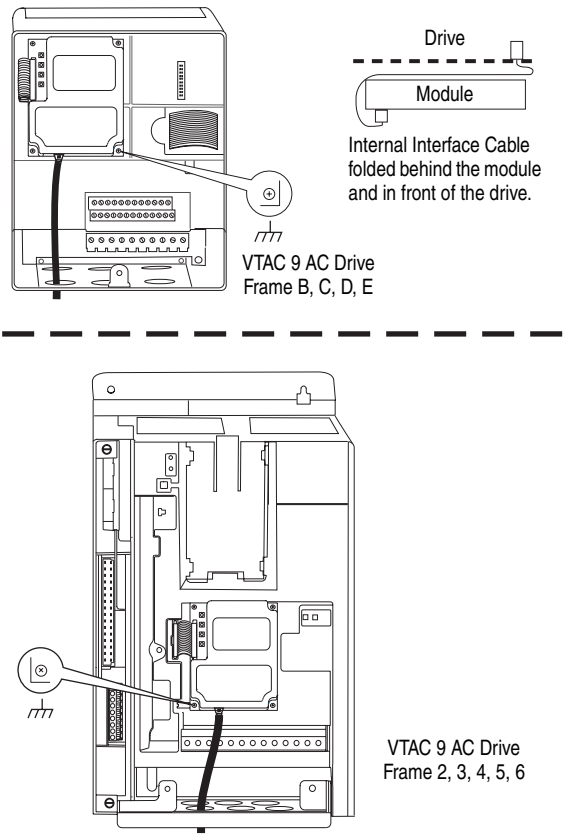
5. Secure and ground the module to the drive by doing the following:

   – On VTAC 9 Frame B, C, D, and E drives, fold the Internal Interface cable behind the module and mount the module on the drive using the four captive screws.

   – On VTAC 9 Frame 2, 3, 4, 5, and 6 drives, mount the module on the drive using the four captive screws.

   Important: Tighten all screws to properly ground the module. Recommended torque is 0.9 N-m (8.0 lb.-in.).

Figure 2.3 Mounting and Grounding the Module

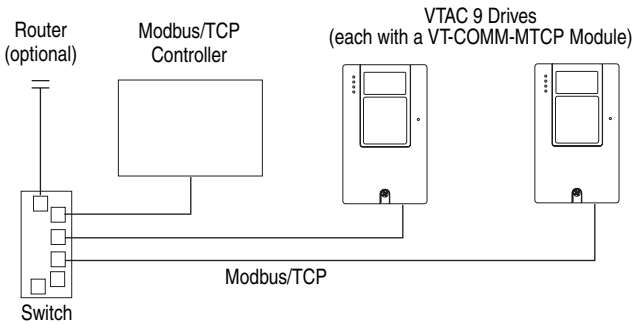


Connecting the Module to the Network

ATTENTION: Risk of injury or death exists. The VTAC 9 drive may contain high voltages that can cause injury or death. Remove power from the drive, and then verify power has been discharged before installing or removing the module.

1. Remove power from the drive.
2. Use static control precautions.
3. Connect an Ethernet cable to the Modbus/TCP network. See Figure 2.4 for an example of wiring to a Modbus/TCP network.

Figure 2.4 Connecting the Ethernet Cable to the Network



4. Route the Ethernet cable through the bottom of the drive (Figure 2.3), and insert the cable's plug into the module's mating receptacle.

Applying Power

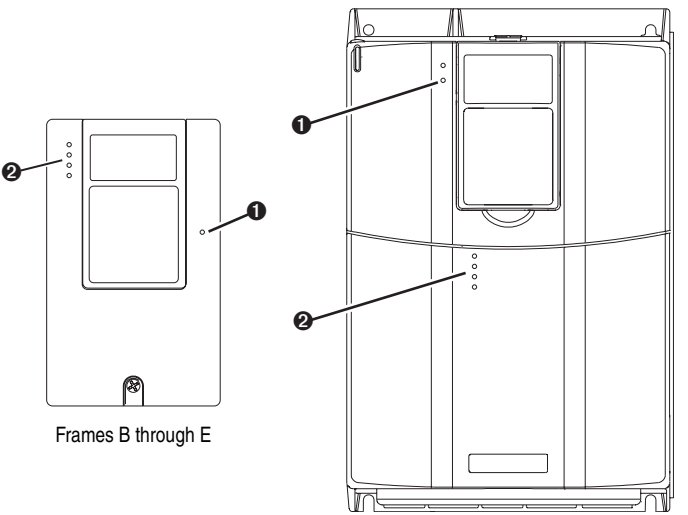
ATTENTION: Risk of equipment damage, injury, or death exists. Unpredictable operation may occur if you fail to verify that parameter settings are compatible with your application. Verify that settings are compatible with your application before applying power to the drive.

Install the drive cover or close the drive door, and apply power to the drive. The module receives its power from the connected drive. When you apply power to the module for the first time, its topmost "Drive" status indicator should be solid green after an initialization. If it is red, there is a problem. Refer to Chapter 5, Troubleshooting.

Start-Up Status Indications

Status indicators for the drive and communications module can be viewed on the front of the drive (Figure 2.5) after power has been applied. Possible start-up status indications are shown in Table 2.A.

Figure 2.5 Drive and Module Status Indicators (location on drive may vary)



Frames B through E

Frames 2 through 6

Table 2.A Drive and Module Start-Up Status Indications

Item	Name	Color	State	Description
Ready Status Indicator on Drive				
❶	Ready	Green	Flashing	Drive ready but not running, and no faults are present.
			Steady	Drive running, no faults are present.
		Yellow	Flashing, Drive Stopped	An inhibit condition exists – the drive cannot be started. Check drive Parameter 214 - [Start Inhibits].
			Flashing, Drive Running	An intermittent type 1 alarm condition is occurring. Check drive Parameter 211 - [Drive Alarm 1].
			Steady, Drive Running	A continuous type 1 alarm condition exists. Check drive Parameter 211 - [Drive Alarm 1].
		Red	Flashing	A fault has occurred.
			Steady	A non-resettable fault has occurred.
Communications Module Status Indicators				
❷	Drive	Green	Flashing	Normal Operation. The module is establishing an I/O connection to the drive. It will turn solid green or red.
			Steady	Normal Operation. The module is properly connected and communicating with the drive.
	MS	Green	Flashing	Normal Operation. The module is operating but is not transferring I/O data.
			Steady	Normal Operation. The module is operating and transferring I/O data.
	NET A	Green	Flashing	Normal Operation. The module is properly connected but does not have an I/O connection.
			Steady	Normal Operation. The module is properly connected and communicating on the network.
	NET B	Green	Off	Normal Operation. The module is properly connected but is idle.
			Flashing	Normal Operation. The module is properly connected and transmitting data packets on the network.

Configuring/Verifying Key Drive Parameters

The VTAC 9 drive can be separately configured for the control and Reference functions in various combinations. For example, you could set the drive to have its control come from a peripheral or terminal block with the Reference coming from the network. Or you could set the drive to have its control come from the network with the Reference coming from another peripheral or terminal block. Or you could set the drive to have both its control and Reference come from the network.

The following steps in this section assume that the drive will receive the Logic Command and Reference from the network.

1. Use drive Parameter 089 - [Logic Source Sel] to select the control method for your application requirements. For example, if the start source is to come from the network, set this parameter value to “5” (Network).

2. Use drive Parameter 090 - [Speed Ref A Sel] to set the drive speed Reference to “22” (Network).

3. Verify that drive Parameter 213 - [Speed Ref Source] is reporting that the source of the Reference to the drive is “22” (Network). This ensures that any Reference commanded from the network can be monitored by using drive Parameter 002 - [Commanded Freq]. If a problem occurs, this verification step provides the diagnostic capability to determine whether the drive/module or the network is the cause.

Commissioning the Module

To commission the module, you must set a unique IP address. (Refer to the Glossary for details about IP addresses.) After installing the module and applying power, you can set the IP address by using a BOOTP server or by setting module parameters.

By default, the module is configured so that you must set the IP address using a BOOTP server. To set the IP address using module parameters, you must disable the BOOTP feature. See Disabling the BOOTP Feature on page 3-6 for details.

Important: New settings for some module parameters (for example, **Parameters 04 - [IP Addr Cfg 1]** through **07 - [IP Addr Cfg 4]**) are recognized only when power is applied to the module or it is reset. After you change parameter settings, cycle power or reset the module.

Configuring the Module

This chapter provides instructions and information for setting the parameters in the module.

For a list of parameters, refer to Appendix B, Module Parameters. For definitions of terms in this chapter, refer to the Glossary.

Configuration Tools

The module stores parameters and other information in its own non-volatile memory. You must, therefore, access the module to view and edit its parameters. The following tools can be used to access the module parameters:

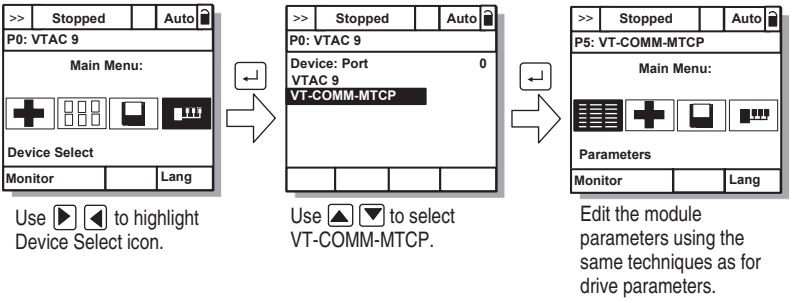
Tool	Refer to...
LCD OIM	page 3-2
BOOTP Server	page 3-3
VS Utilities Software (version 3.xx or higher)	*VS Utilities Getting Results Manual*, and VS Utilities online help (installed with the software)

Using the LCD OIM

To access parameters in the module using the LCD OIM, refer to the procedure in Figure 3.1.

If you are unfamiliar with the operation of the LCD OIM, refer to the VTAC 9 Drive User Manual for more information.

Figure 3.1 Accessing the Module Parameters Using the LCD OIM



Using BOOTP

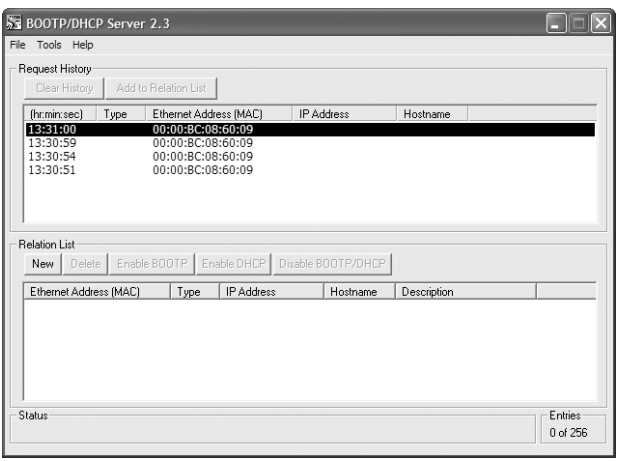
By default, the module is configured so that you can set its IP address, subnet mask, and gateway address by using a BOOTP utility. You can select from a variety of BOOTP utilities. These instructions use Rockwell's BOOTP Server (version 2.3 or higher), a stand-alone program that incorporates the functionality of standard BOOTP utilities with a graphical interface. It is available from http://www.ab.com/networks/bootp.html. Refer to the Readme file and online Help for detailed directions and information.

TIP: If desired, you can disable BOOTP and configure the IP address, subnet mask, and gateway address by setting parameters. For details, see Setting the IP Address, Subnet Mask, and Gateway Address on page 3-6.

Configuring the Module Using BOOTP Server

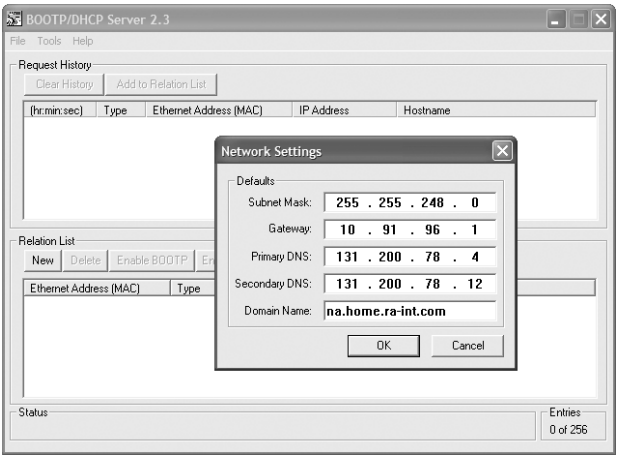
1. On the module label, locate and note the module's hardware address.
2. On a computer connected to the Modbus/TCP network, start the BOOTP software. The BOOTP Server window (Figure 3.2) appears.

Figure 3.2 BOOTP Server Window



3. To properly configure devices on your Modbus/TCP network, you must configure settings in the BOOTP software to match the network. Select **Tools > Network Settings** to display the Network Settings window (Figure 3.3).

Figure 3.3 Network Settings Window



4. Edit the following:

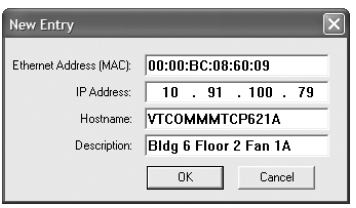
Box	Type
Subnet Mask (1)	The subnet mask for the module's network.
Gateway (1)	The IP address of the gateway device on the module's network.
Primary DNS	The address of the primary DNS server to be used on the local end of the link for negotiating with remote devices.
Secondary DNS	Optional — the address of the secondary DNS server to be used on the local end of the link for negotiating with remote devices when the primary DNS server is unavailable.
Domain Name	The text name corresponding to the numeric IP address that was assigned to the server that controls the network.

(1) For definitions of these terms, refer to the Glossary.

5. Click **OK** to apply the settings. Devices on the network issuing BOOTP requests appear in the BOOTP Request History list.

6. In the BOOTP Request History list, double-click the hardware address (Ethernet MAC address) of the module, or in the Relation List, click **New**. The New Entry window (Figure 3.4) appears.

Figure 3.4 New Entry Window



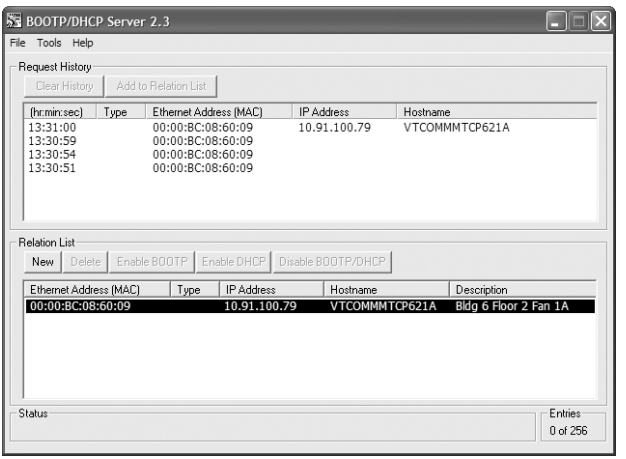
7. Edit the following:

Box	Type
IP Address (1)	A unique IP address for the module.
Host Name	Optional
Description	Optional

(1) For a definition of this term, refer to the Glossary.

8. Click **OK** to apply the settings. The module appears in the Relation List (Figure 3.5) with the new settings.

Figure 3.5 BOOTP Server Window with Module in the Relation List



9. To assign this configuration to the module permanently, select the device in the Relation List and click **Disable BOOTP/DHCP**. When power is cycled on the module, it will use the configuration you assigned it and not issue new BOOTP requests.

TIP: To enable BOOTP for a module that has had BOOTP disabled, first select the module in the Relation List, then click **Enable BOOTP**, and finally reset the module or power cycle the drive.

10. To save the Relation List, select **File > Save**.

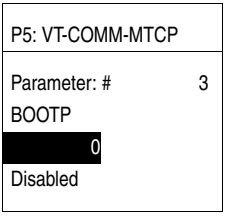
Setting the IP Address, Subnet Mask, and Gateway Address

By default, the module is configured so that you set its IP address, subnet mask, and gateway address using a BOOTP server. If you want to set these attributes using the module's parameters instead, you must disable BOOTP and then set the appropriate parameters in the module.

Disabling the BOOTP Feature

1. Set the value of **Parameter 03 - [BOOTP]** to "0" (Disabled).

Figure 3.6 Example BOOTP Screen on an LCD OIM



Value	Setting
0	Disabled
1	Enabled (Default)

2. Reset the module (see Resetting the Module on page 3-13).

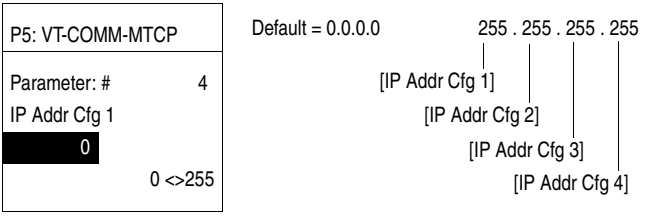
After disabling the BOOTP feature, you can then configure the IP address, subnet mask, and gateway address using module parameters.

Setting an IP Address Using Parameters

1. Verify that **Parameter 03 - [BOOTP]** is set to "0" (Disabled). This parameter must be set to Disabled to configure the IP address using the module parameters.

2. Set the value of **Parameters 04 - [IP Addr Cfg 1]** through **07 - [IP Addr Cfg 4]** to a unique IP address.

Figure 3.7 Example IP Address Screen on an LCD OIM



3. Reset the module (see Resetting the Module on page 3-13).

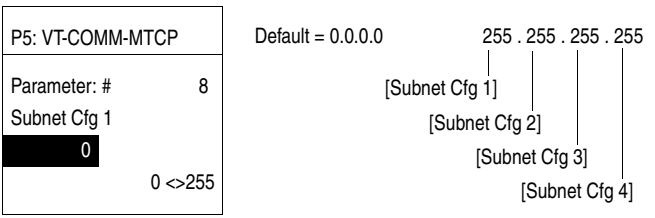
   The NET A status indicator will be solid green or flashing green if the IP address is correctly configured.

Setting a Subnet Mask Using Parameters

1. Verify that **Parameter 03 - [BOOTP]** is set to "0" (Disabled). This parameter must be set to Disabled to configure the subnet mask using the module parameters.

2. Set the value of **Parameters 08 - [Subnet Cfg 1]** through **11 - [Subnet Cfg 4]** to the desired value for the subnet mask.

Figure 3.8 Example Subnet Mask Screen on an LCD OIM



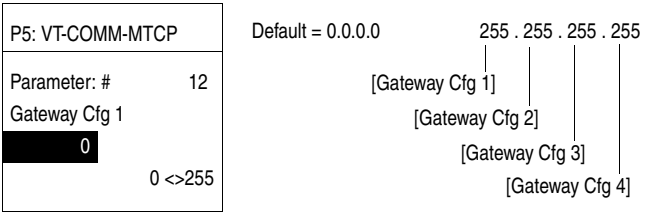
3. Reset the module (see Resetting the Module on page 3-13).

Setting a Gateway Address for the Module Using Parameters

1. Verify that **Parameter 03 - [BOOTP]** is set to "0" (Disabled). This parameter must be set to Disabled to configure the gateway address using the module parameters.

2. Set the value of **Parameters 12 - [Gateway Cfg 1]** through **15 - [Gateway Cfg 4]** to the IP address of the gateway device.

Figure 3.9 Example Gateway Screen on an LCD OIM



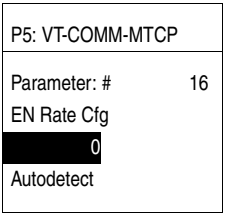
3. Reset the module (see Resetting the Module on page 3-13).

Setting the Data Rate

By default, the module is set to autodetect, so it automatically detects the data rate and duplex setting used on the network. If you need to set a specific data rate and duplex setting, the value of **Parameter 16 - [EN Rate Cfg]** determines the Ethernet data rate and duplex setting that the module will use to communicate. For definitions of data rate and duplex, refer to the Glossary.

1. Set the value of **Parameter 16 - [EN Rate Cfg]** to the data rate at which your network is operating.

Figure 3.10 Example Ethernet Data Rate Screen on an LCD OIM



Value	Data Rate
0	Autodetect (default)
1	10 Mbps Full
2	10 Mbps Half
3	100 Mbps Full
4	100 Mbps Half

TIP: Auto detection of baud rate and duplex works properly only if the device (usually a switch) on the other end of the cable is also set to auto detect the baud rate/duplex. If one device has the baud rate/duplex hard coded, the other device must be hard-coded to the same settings.

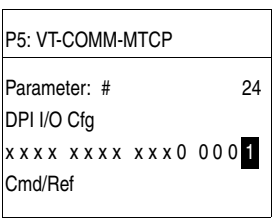
2. Reset the module (see Resetting the Module on page 3-13).

Setting the I/O Configuration

The I/O configuration determines the data that is sent to and from the drive. Logic Command/Status, Reference/Feedback, and Datalinks may be enabled or disabled. A “1” enables the I/O. A “0” disables the I/O.

1. Set the bits in **Parameter 24 - [DPI I/O Cfg]**.

Figure 3.11 Example I/O Configuration Screen on an LCD OIM



Bit	Description
0	Logic Command/Reference (Default)
1	Datalink A
2	Datalink B
3	Datalink C
4	Datalink D
5 - 15	Not Used

Bit 0 is the right-most bit. In Figure 3.11, it is highlighted and equals "1."

2. If Logic Command/Reference is enabled, configure the parameters in the drive to accept the Logic Command and Reference from the module. For example, set Parameter 90 - [Speed Ref A Sel] in a VTAC 9 drive to "22" (Network) so that the drive uses the Reference from the module. Also, verify that drive Parameter 286 - [Manual Mask] is configured to receive the desired logic from the module. Refer to the documentation for your drive for details.

3. If you enabled one or more Datalinks, configure parameters in the drive to determine the source and destination of data in the Datalink(s). For example, configure the Datalinks in a VTAC 9 drive by setting Parameters 300 - [Data In A1] to 317 - [Data Out D2]. Also, ensure that the Modbus/TCP module is the only module using the enabled Datalink(s).

4. Reset the module (see Resetting the Module on page 3-13).

The module is ready to receive I/O.

Setting a Comm Flt Action

By default, when communications are disrupted (for example, a cable is disconnected), the drive responds by faulting if it is using I/O from the network. You can configure a different response to communication disruptions using **Parameter 23 - [Comm Flt Action]**.

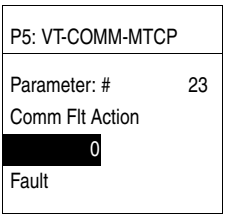
ATTENTION: Risk of injury or equipment damage exists. **Parameter 23 - [Comm Flt Action]** lets you determine the action of the module and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Take precautions to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

Changing the Comm Flt Action

Set the value of **Parameter 23 - [Comm Flt Action]** to the desired response action:

Value	Action	Description
0	Fault	The drive is faulted and stopped. (Default)
1	Stop	The drive is stopped, but not faulted.
2	Zero Data	The drive is sent 0 for output data. This does not command a stop.
3	Hold Last	The drive continues in its present state.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters (**Parameters 26 - [Flt Cfg Logic]** through **35 - [Flt Cfg D2 In]**).

Figure 3.12 Example Comm Flt Action Screen on an LCD OIM



Changes to this parameter take effect immediately. A reset is not required.

Setting the Fault Configuration Parameters

If you set **Parameter 23 - [Comm Flt Action]** to "Send Flt Cfg," the values in the following parameters are sent to the drive after a communications fault occurs. You must set these parameters to values required by your application.

Parameter	Name	Description
26	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command.
27	Flt Cfg Ref	A 32-bit value (0 – 4294967295) sent to the drive as a Reference or Datalink. **Important:** If the drive uses a 16-bit Reference or 16-bit Datalinks, the most significant word of the value must be set to zero (0) or a fault will occur.
28 – 35	Flt Cfg x1 In or Flt Cfg x2 In	

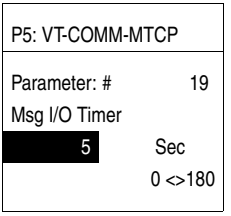
Changes to these parameters take effect immediately. A reset is not required.

Setting the Msg I/O Timer

Set **Parameter 19 - [Msg I/O Timer]** to a communication loss timeout period suitable for your application. By default, the timeout is set to five (5) seconds. You can increase or decrease this value. Alternatively, you can set the value to zero (0) to disable this timeout feature so that the module does not detect communication losses.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 19 - [Msg I/O Timer]** lets you determine how long it will take the module to detect network communication losses. By default, this parameter sets the timeout to five (5) seconds. You can set it so that the duration is shorter, longer, or disabled. When set to disabled, this also disables module **Parameter 23 - [Comm Flt Action]**. Therefore, a communications fault action will be ignored. Take precautions to ensure that the setting does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

Figure 3.13 Example Msg I/O Timer Screen on an LCD OIM



Changes to this parameter take effect immediately. A reset is not required.

Setting Web Access Control

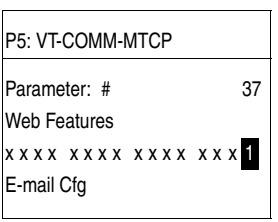
By using a web browser to access the IP address set for the module, you can view the module's web pages for information about the module, its connected drive, and other DPI devices connected to the drive, such as OIMs or converters. Additionally, the module can be configured to automatically send e-mail messages to desired addresses when selected drive faults occur and/or are cleared, and/or when the module takes a communication fault action. For more details on the module's web pages, refer to Chapter 6, Viewing the Module's Web Pages.

By default, the module web pages are disabled. Refer to Figure 2.1 and set the Web Pages Switch (SW2) to the "Enable Web" (up) position.

Important: For a change to the switch setting to take effect, the module must be reset (see Resetting the Module on page 3-13).

Bit 0 of **Parameter 37 - [Web Features]** is used to protect the configured settings for e-mail messaging. By default, settings are not protected and the user can make changes. To protect the configured settings, set the value of E-mail Cfg Bit 0 to "0" (Disabled). You can unprotect the configuration by changing Bit 0 back to "1" (Enabled). E-mail messaging will always remain active regardless of whether or not its settings are protected — unless e-mail messaging was *never* configured. For more information about configuring module e-mail messaging or to stop e-mail messages, refer to Configure E-mail Notification Web Page on page 6-6.

Figure 3.14 Example Web Features Screen on an LCD OIM



Bit	Description
0	E-mail Cfg (Default = 1 = enabled)
1 - 7	Not Used

Bit 0 is the right-most bit. In Figure 3.14 it is highlighted and equals "1."

Changes to this parameter take effect immediately. A reset is not required.

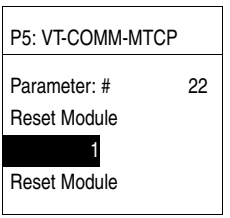
Resetting the Module

Changes to switch settings and some module parameters require that you reset the module before the new settings take effect. You can reset the module by cycling power to the drive or by using **Parameter 22 - [Reset Module]**.

ATTENTION: Risk of injury or equipment damage exists. If the module is transmitting control I/O to the drive, the drive may fault when you reset the module. Determine how your drive will respond before resetting a connected module.

Set **Parameter 22 - [Reset Module]** to "1" (Reset Module).

Figure 3.15 Example Reset Screen on an LCD OIM



Value	Description
0	Ready (Default)
1	Reset Module
2	Set Defaults

When you enter "1" (Reset Module), the module will be immediately reset. When you enter "2" (Set Defaults), the module will set all module parameters to their factory-default settings. After performing a Set Defaults, enter "1" (Reset Module) so that the new values take effect. The value of this parameter will be restored to "0" (Ready) after the module is reset.

Viewing the Module Configuration

The following parameters provide information about how the module is configured. You can view these parameters at any time.

<table>
<tr><th>Number</th><th>Name</th><th>Description</th></tr>
<tr><td>17</td><td>EN Rate Act</td><td>The data rate used by the module.</td></tr>
<tr><td>18</td><td>Modbus/TCP Port</td><td>The port used to transport Modbus/TCP messages.</td></tr>
<tr><td>20</td><td>Ref/Fdbk Size</td><td>The size of the Reference/Feedback. It will either be 16 bits or 32 bits. It is set in the drive and the module automatically uses the correct size.</td></tr>
<tr><td>21</td><td>Datalink Size</td><td>The size of the Datalinks. It will either be 16 bits or 32 bits. It is set in the drive and the module automatically uses the correct size.</td></tr>
<tr><td>25</td><td>DPI I/O Act</td><td>The Reference/Feedback and Datalinks used by the module. This value is the same as Parameter 24 - [DPI I/O Cfg] unless the parameter was changed and the module was not reset.
<table>
<tr><td>Bit Definition</td><td>Not Used</td><td>Not Used</td><td>Not Used</td><td>Datalink D</td><td>Datalink C</td><td>Datalink B</td><td>Datalink A</td><td>Cmd/Ref</td></tr>
<tr><td>Default</td><td>x</td><td>x</td><td>x</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>Bit</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
</table>
</td></tr>
</table>

Using Modbus/TCP Function Codes

This chapter provides information about controlling a VTAC 9 drive, setting its Reference, and accessing its parameters and the parameters of its connected peripherals using Modbus/TCP Function Codes over the Modbus/TCP network.

Understanding Modbus/TCP

The Modbus/TCP protocol is a messaging structure used to establish master-slave communication between intelligent devices. The protocol defines the format of the messages.

Messages from a master to a slave contain the address of the slave, a Function Code defining the requested action, and any data to be sent. Messages from a slave to a master contain fields confirming the action taken and any data to be returned. If an error occurred in the receipt of the message or if the slave is unable to perform the requested action, the slave will construct an error message and send it as its response.

Modbus/TCP can access a single address or multiple addresses simultaneously, either reading or writing single-bit values, 16-bit values, or 32-bit values.

Important: Modbus/TCP devices can be 0-based (register addresses numbered starting at 0) or 1-based (register addresses numbered starting at 1). The convention in this manual is 1-based. Depending on the Modbus/TCP master used, the register addresses listed in this chapter may need to be offset by -1. For example, Logic Command is register address 10001 for some master devices and register address 10000 for others.

Supported Modbus/TCP Function Codes

On Modbus/TCP, a register is defined as an addressable container that holds 16-bit data. All parameters (16-bit or 32-bit) for the drive and its connected peripherals always occupy two consecutive 16-bit registers — one for the Lo Word and one for the Hi Word — even if the parameter is only a 16-bit word. In this case, the parameter value is the Lo Word.

The module supports the Modbus/TCP function codes listed in Table 4.A.

Table 4.A Supported Modbus/TCP Function Codes

Function Code	Name	Description
01	Read Coils (also known as Read Discrete Outputs)	Reads groups of up to 16 output bits simultaneously in the Logic Command word.
02	Read Discrete Inputs	Reads groups of up to 16 input bits simultaneously in the Logic Status word.
03	Read Holding Registers (one or many)	Reads any single or multiple parameters of the drive or its connected peripherals. It also reads the Logic Command, Logic Status, Reference, Feedback, or Datalink words.
05	Write Single Coil (also known as Write Discrete Output)	Writes to individual output bits or groups of output bits in the Logic Command word.
06	Write Single Register	Writes to the Logic Command word or Keep-Alive register.
15	Write Multiple Coils (also known as Write Multiple Discrete Outputs)	Writes to groups of up to 16 output bits simultaneously in the Logic Command word.
16	Write Multiple Registers (one or many)	Writes to any group of parameters of the drive or its connected peripherals. It also writes to the Logic Command, Reference, or Datalink (Data In xx) words.
23	Read/Write Multiple Registers (also known as Read/Write Parameters)	Reads and/or writes to any group of parameters of the drive or its connected peripherals. It also reads the Logic Command, Logic Status, Reference, Feedback, or Datalink words — and writes to the Logic Command, Reference, and Datalinks.
43	Read Device Identification	Reads the vendor name, product code, and major/minor firmware version of the connected drive.

Unit Identifier (Port Number)

The Modbus/TCP Application Data Unit includes a Unit Identifier which is used by a Modbus/TCP gateway to route to remote serial Modbus slave devices. The VT-COMM-MTCP module acts similarly as a gateway to DPI devices and uses the Unit Identifier as the DPI Port Number (0-6) to access parameters in those connected peripherals. Since the module can be connected to different ports, a Unit Identifier of "255" can be used to always access parameters in the module. When the specific DPI port to which a device is connected is known, you can use this port number as the Unit Identifier.

Table 4.B Unit Identifiers

Unit Identifier	Device Connection (Example)
0	DPI Port 0 (Drive)
1	DPI Port 1 (OIM in drive cradle)
2	DPI Port 2 (remote-mount OIM)
3	DPI Port 3 (peripheral connected to Port 3 of a two-way or four-way splitter cable)
4	DPI Port 4 (peripheral connected to Port 4 of a four-way splitter cable)
5	DPI Port 5 (peripheral connected to the drive's internal Port 5 or to Port 5 of a four-way splitter cable)
6	DPI Port 6 (reserved for future use)
7 - 15	Reserved for future use
16	DPI Port 0 (Drive) — an alternate to using Unit Identifier 0
17 - 254	Unused — defaults to Unit Identifier 0
255	Module

Using Function Code 43 to Read Drive Identification

Function Code 43 enables you to read the drive's vendor name, product code, and major/minor firmware version. To do this, always set the following Modbus/TCP transaction elements to these values:

Modbus/TCP Transaction Element	Required Value (Decimal)
Unit Identifier	0 (zero) or 16
MEI (Modbus Encapsulated Interface)	14
Read Device ID Code	1
Object Id	0 (zero)

Using the I/O

On Modbus/TCP, data transfers are used to transfer the I/O data that controls the drive and sets its Reference. Note that *output I/O* is data that the master device sends and the module receives. *Input I/O* is status data that the module sends and the master device receives.

Important: To enable the drive to use the I/O and Reference from the Modbus/TCP network, you must set parameters in the drive to receive the I/O and Reference. For details, refer to Configuring/Verifying Key Drive Parameters on page 2-7.

Keep-Alive Register (Address 10002)

The Keep-Alive register enables you to reset the module's internal communication loss timer to the value set in module **Parameter 19 - [Msg I/O Timer]**. A decimal value between 0 and 65535 can be written to the Keep-Alive register address 10002 to reset the timer. This value is not stored and does not affect any data transaction. It is a convenient way to reset the timer without writing to the Logic Command, Reference, or Datalink (Data In xx) words.

Important: To avoid a communication loss, a value must be written to register address 10002 more frequently than the timeout value set in **Parameter 19 - [Msg I/O Timer]**. For example, with parameter 19 set to 5 seconds (default), write a value to register address 10002 every 4.9 seconds or less.

Peripheral Status Register (Address 10022)

The Peripheral Status register contains information on which DPI Ports presently have a peripheral connected and logged into the drive according to Table 4.C. By using Function Code 03 or 23, you can read register address 10022 to conveniently determine which DPI Ports and peripherals are in use.

Table 4.C Peripheral Status Register Data

Bit	Peripheral
0	This module
1	DPI Port 1
2	DPI Port 2
3	DPI Port 3
4	DPI Port 4
5	DPI Port 5
6	DPI Port 6 (reserved for future use)

Setting the Logic Command and Reference

ATTENTION: When using Function Codes to write to the Logic Command or Reference, avoid sending the drive control commands from multiple sources which can cause a conflict and result in dangerous operation. Failure to observe this precaution could cause bodily injury and/or damage to equipment.

On Modbus/TCP, you can set the Logic Command word using any of the following function codes:

- Function Code 05 — For example, to stop a VTAC 9 drive (bit 0), write a binary value of "1" to register address 1 (Table 4.D).
- Function Code 06 — For example, to stop a VTAC 9 drive (bit 0), write a decimal value of "1" to register address 10001 (Table 4.E).
- Function Code 15 — For example, to select Ref 1 (Ref A Sel) as the Reference for a VTAC 9 drive (bits 12, 13, and 14), write a binary value of "1" to register address 13 and values of "0" (zero) to register addresses 14 and 15 (Table 4.D).
- Function Code 16 or 23 — For example, to set the direction for a VTAC 9 drive (bits 4 - 5), write a decimal value of "16" to command a forward direction or a decimal value of "32" to command a reverse direction, and to start the drive (bit 1) write a decimal value of "2" to register address 10001 (Table 4.E).

Table 4.D shows that there are 16 discrete registers to represent the Logic Command word bit by bit. These registers are used only for writing single bits or multiple bits of commands.

Table 4.D Logic Command Registers (to Drive from Controller)

Register Address	Logic Command Bit	VTAC 9 Drive Example	
		Description	Values
1	0	Stop	0 = Not Stop 1 = Stop
2	1	Start (1) (2)	0 = Not Start 1 = Start
3	2	Jog	0 = Not Jog 1 = Jog
4	3	Clear Faults (2)	0 = Not Clear Faults 1 = Clear Faults
5 6	4 5	Direction	Register Address 6 5 0 0 = No Command 0 1 = Forward Command 1 0 = Reverse Command 1 1 = Hold Direction Control

Table 4.D Logic Command Registers (to Drive from Controller) (Continued)

Register Address	Logic Command Bit	VTAC 9 Drive Example	
		Description	Values
7	6	Local Control	0 = No Local Control 1 = Local Control
8	7	MOP Increment	0 = Not Increment 1 = Increment
9 10	8 9	Accel Rate	Register Address 10 09 0 0 = No Command 0 1 = Accel Rate 1 Command 1 0 = Accel Rate 2 Command 1 1 = Hold Accel Rate
11 12	10 11	Decel Rate	Register Address 12 11 0 0 = No Command 0 1 = Decel Rate 1 Command 1 0 = Decel Rate 2 Command 1 1 = Hold Decel Rate
13 14 15	12 13 14	Reference Select	Register Address 15 14 13 0 0 0 = No Command 0 0 1 = Ref 1 (Ref A Select) 0 1 0 = Ref 2 (Ref B Select) 0 1 1 = Ref 3 (Preset 3) 1 0 0 = Ref 4 (Preset 4) 1 0 1 = Ref 5 (Preset 5) 1 1 0 = Ref 6 (Preset 6) 1 1 1 = Ref 7 (Preset 7)
16	15	MOP Decrement	0 = Not Decrement 1 = Decrement

(1) A “0 = Not Stop” condition (logic 0) must first be present before a “1 = Start” condition will start the drive.

(2) To perform this command, the value must change from “0” to “1.”

Table 4.E shows the Logic Command register used for writing 16-bit commands or multiple decimal values.

Table 4.E Logic Command Register

Register Address	Description	Values
10001	Logic Command	16-bit word. Bit definitions for VTAC 9 drives are in Table 4.D. For other products, refer to their documentation.

To set the Reference, you must write the decimal values to register addresses 10003 through 10004 (Table 4.F) using Function Code 16 or 23.

Table 4.F Reference Registers

Register Address	Description	Values
10003 (1)	Reference Lo	Bit 0-15 of 32-bit Reference or the whole 16-bit Reference
10004	Reference Hi	Bit 16-31 of 32-bit Reference

(1) For a 16-bit Reference, you must write the complete 32-bit value.

Remember that the Reference value is a scaled value; it is not an engineering value. For example, in VTAC 9 drives, the reference is scaled based on the value of Parameter 55 - [Maximum Freq], but the commanded maximum speed can never exceed the value of Parameter 82 - [Maximum Speed]. Table 4.G shows example References and their results on a VTAC 9 drive that has its Parameter 55 - [Maximum Freq] set to 130 Hz and Parameter 82 - [Maximum Speed] set to 60 Hz.

Table 4.G Example Speed Reference and Feedback for a VTAC 9 Drive

Reference Value	Scale		Output Speed	Feedback Value
	Percent	Value		
32767 (1)	100%	130 Hz	60 Hz (2)	15123 (3)
16384	50%	65 Hz	60 Hz (2)	15123 (3)
8192	25%	32.5 Hz	32.5 Hz	8192
0	0%	0 Hz	0 Hz	0

(1) A value of 32767 is equivalent to 100%. The effects of values greater than 32767 depend on whether the DPI product uses a bipolar or unipolar direction mode. Refer to the documentation for your DPI product.

(2) The drive runs at 60 Hz instead of 130 Hz or 65 Hz because Parameter 82 - [Maximum Speed] sets 60 Hz as the maximum speed.

(3) The Feedback value is also scaled based on the value of Parameter 55 - [Maximum Freq], For example, 60/130 = 0.46 so 32767 x 0.46 = 15123.

Reading the Logic Status and Feedback

On Modbus/TCP, you can read the Logic Status word using any of the following function codes:

- Function Code 02 — For example, to verify that a VTAC 9 drive is ready (bit 0), read register address 1 (Table 4.H).
- Function Code 03 or 23 — For example, to read the complete Logic Status word in a VTAC 9 drive, read register address 10001 (Table 4.I).

Table 4.H shows that there are 16 discrete registers to represent the Logic Status word bit by bit. These registers are used only for reading single bits or multiple bits of status.

Table 4.H Logic Status Registers (to Controller from Drive)

Register Address	Logic Status Bit	VTAC 9 Drive Example	
		Description	Values
1	0	Ready	0 = Not Ready 1 = Ready
2	1	Active	0 = Not Running 1 = Running
3	2	Command Direction	0 = Reverse 1 = Forward
4	3	Actual Direction	0 = Reverse 1 = Forward
5	4	Accel	0 = Not Accelerating 1 = Accelerating
6	5	Decel	0 = Not Decelerating 1 = Decelerating
7	6	Alarm	0 = No Alarm 1 = Alarm
8	7	Fault	0 = No Fault 1 = Fault
9	8	At Speed	0 = Not At Reference 1 = At Reference
10 11 12	9 10 11	Local Control	Register Address 12 11 10 0 0 0 = Port 0 (TB) 0 0 1 = Port 1 0 1 0 = Port 2 0 1 1 = Port 3 1 0 0 = Port 4 1 0 1 = Port 5 1 1 0 = Port 6 1 1 1 = No Local

Table 4.H Logic Status Registers (to Controller from Drive) (Continued)

Register Address	Logic Status Bit	VTAC 9 Drive Example	
		Description	Values
13	12	Reference	Register Address
14	13		16 15 14 13
15	14		0 0 0 0 = Ref A Auto
16	15		0 0 0 1 = Ref B Auto
			0 0 1 0 = Preset 2 Auto
			0 0 1 1 = Preset 3 Auto
			0 1 0 0 = Preset 4 Auto
			0 1 0 1 = Preset 5 Auto
			0 1 1 0 = Preset 6 Auto
			0 1 1 1 = Preset 7 Auto
			1 0 0 0 = Term Blk Manual
			1 0 0 1 = DPI 1 Manual
			1 0 1 0 = DPI 2 Manual
			1 0 1 1 = DPI 3 Manual
			1 1 0 0 = DPI 4 Manual
			1 1 0 1 = DPI 5 Manual
			1 1 1 0 = DPI 6 manual
			1 1 1 1 = Jog Ref

Table 4.I shows the Logic Status register used for reading 16-bit status fields or multiple decimal values.

Table 4.I Logic Status Register

Register Address	Description	Values
10021	Logic Status Word	16-bit word. Bit definitions for VTAC 9 drives are in Table 4.H. For other products, refer to their documentation.

To view the Feedback, you must read the decimal values of register addresses 10023 through 10024 (Table 4.J) using Function Code 03 or 23. For details about how the Feedback is scaled, refer to the Table 4.G.

Table 4.J Feedback Registers

Register Address	Description	Values
10023 (1)	Feedback Lo	Bit 0-15 of 32-bit Feedback or the whole 16-bit Feedback
10024	Feedback Hi	Bit 16-31 of 32-bit Feedback

(1) For a 16-bit Feedback, you must read the complete 32-bit value.

Accessing Device Parameters

There are two methods for accessing parameters in the drive or its connected peripherals: the direct access method (for individual or contiguous parameters) and the indirect access method (for contiguous or non-contiguous parameters).

Direct Access Method

ATTENTION: Risk of equipment damage exists. When data registers are used to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently writes parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters. See Using Datalinks on page 4-14 for more information.

You can use Function Code 03 or 23 to read single or multiple device (drive or its connected peripheral) parameters, and Function Code 16 or 23 to write single or multiple device parameters (see Table 4.A). However, Function Code 06 (Write Single Register) cannot be used because all device parameters being written to require two contiguous register addresses.

By using the appropriate Unit Identifier for a device (Table 4.B), you can directly access its parameters. Device parameter data is always contained in a Lo Word and a Hi Word which reside in contiguous Modbus/TCP register addresses. Therefore, the data in the starting register address and the next contiguous register address must be read together as a pair. The starting register address is determined by:

Starting Register Address = (Device Parameter No. x 2) - 1

For example, to access drive Parameter 003 - [Output Current] first set the Unit Identifier to 0 (zero) to access drive parameters. Then use the formula above to determine the starting register address for drive Parameter 003 - [Output Current] data:

Starting Register Address = (3 x 2) - 1 = 5

In this example, read both the starting register address 5 (Lo Word) and register address 6 (Hi Word) to receive drive Parameter 003 - [Output Current] data.

Indirect Access Method

ATTENTION: Risk of equipment damage exists. When module **Parameters 38 - [Indirect Par #1]** through **53 - [Indirect Par #16]** and their corresponding data registers are used to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses Indirect Parameters to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters. See Using Datalinks on page 4-14 for more information.

Module **Parameters 38 - [Indirect Par #1]** through **53 [Indirect Par #16]** allow reading and writing to contiguous or non-contiguous sets of parameters for the drive or any of its connected peripherals using Function Code 03, 16 or 23. This can be done by writing the Indirect Par #x Value (formula shown below) to the corresponding Indirect Par #x parameter in the module. Module **Parameters 38 - [Indirect Par #1]** through **53 [Indirect Par #16]** enable you to set up a group of commonly read and written parameters and transfer that data in one transaction. Table 4.K shows the Indirect Par #x target address ranges and the peripherals to which they apply:

Table 4.K Indirect Par #x Target Address Ranges for Peripherals

Address Range	Peripheral
0 - 9999	Drive
10000 - 10999	Module
11000 - 11999	Peripheral connected to DPI Port 1
12000 - 12999	Peripheral connected to DPI Port 2
13000 - 13999	Peripheral connected to DPI Port 3
14000 - 14999	Peripheral connected to DPI Port 4
15000 - 15999	Peripheral connected to DPI Port 5
16000 - 16999	Reserved for future use

To determine the value of a module Indirect Par #x for a specific device, use the following formula:

Indirect Par #x Value = Device Starting Address + Parameter No.

For example, suppose the module is connected to the drive's internal Port 5 and you want to use module **Parameter 38 - [Indirect Par #1]** to access module **Parameter 22 - [Reset Module]** to reset the module. Using this formula:

Indirect Par #x Value = 15000 + 22 = 15022

In this case, set module **Parameter 38 - [Indirect Par #1]** to a value of "15022" to access module **Parameter 22 - [Reset Module]**.

TIP: If the port to which the module is connected is not known, always use "10000" for the Device Starting Address in the formula above. In this case, set module **Parameter 38 - [Indirect Par #1]** to a value of "10022" for this example to access module **Parameter 22 - [Reset Module]**.

Reading Device Parameters

1. Verify that the Unit Identifier is set to "0" (zero) or "16."

2. Using Table 4.K and its associated formula, determine the value to use for a module Indirect Par #x that points to the specific device parameter you want to read. For example, suppose module **Parameter 38 - [Indirect Par #1]** is used and you want to read drive Parameter 003 - [Output Current] or drive Parameter 012 - [DC Bus Voltage]. In this case, set module **Parameter 38 - [Indirect Par #1]** to a value of "3" or "12" respectively.

3. Use Function Code 03 or 23 (Table 4.A) to read the value(s) of specific device parameter(s). For this example, read register addresses 10041 through 10042 for module Indirect Parameter #1 Data as shown in Table 4.L.

Table 4.L Register Addresses for Indirect Parameter Data

Register Address	Description	Detail
10041	Indirect Parameter #1 Data	Lo Word
10042		Hi Word
10043	Indirect Parameter #2 Data	Lo Word
10044		Hi Word
10045	Indirect Parameter #3 Data	Lo Word
10046		Hi Word
10047	Indirect Parameter #4 Data	Lo Word
10048		Hi Word
10049	Indirect Parameter #5 Data	Lo Word
10050		Hi Word
10051	Indirect Parameter #6 Data	Lo Word
10052		Hi Word
10053	Indirect Parameter #7 Data	Lo Word
10054		Hi Word
10055	Indirect Parameter #8 Data	Lo Word
10056		Hi Word
10057	Indirect Parameter #9 Data	Lo Word
10058		Hi Word

Table 4.L Register Addresses for Indirect Parameter Data (Continued)

Register Address	Description	Detail
10059	Indirect Parameter #10 Data	Lo Word
10060		Hi Word
10061	Indirect Parameter #11 Data	Lo Word
10062		Hi Word
10063	Indirect Parameter #12 Data	Lo Word
10064		Hi Word
10065	Indirect Parameter #13 Data	Lo Word
10066		Hi Word
10067	Indirect Parameter #14 Data	Lo Word
10068		Hi Word
10069	Indirect Parameter #15 Data	Lo Word
10070		Hi Word
10071	Indirect Parameter #16 Data	Lo Word
10072		Hi Word

Writing Device Parameters

1. Verify that the Unit Identifier is set to “0” (zero).

2. Using Table 4.K and its associated formula, determine the value to use for a module Indirect Parameter that points to the specific device parameter you want to write. For example, suppose module **Parameter 38 - [Indirect Par #1]** is used and you want to write to drive Parameter 140 - [Accel Time 1]. In this case, set module **Parameter 38 - [Indirect Par #1]** to a value of “140.”

3. Use Function Code 16 or 23 (Table 4.A) to write a desired value to the specific device parameter(s). For this example, write a value of “20” (2.0 seconds) to register addresses 10041 through 10042 for module Indirect Parameter #1 Data as shown in Table 4.L.

Using Datalinks

A Datalink is a mechanism used by VTAC 9 drives to transfer data to and from the controller. Datalinks allow a drive parameter value to be changed without accessing the specific parameter. When enabled, each Datalink occupies two 16-bit or 32-bit words in both the input and output image. Module **Parameter 22 - [Datalink Size]** indicates whether the drive uses 16-bit or 32-bit words for Datalinks.

Rules for Using Datalinks

- Each set of Datalink parameters in a VTAC 9 drive can be used by only one module. If more than one module is connected to a single drive, multiple modules must not try to use the same Datalink.
- Parameter settings in the drive determine the data passed through the Datalink mechanism. Refer to the documentation for your drive.
- When you use a Datalink to change a value, the value is NOT written to the Non-Volatile Storage (NVS). The value is stored in volatile memory and lost when the drive loses power. Thus, use Datalinks when you need to change a value of a parameter frequently.

Reading Datalinks

Use the register addresses in Table 4.M to read Datalinks using Function Code 03 or 23.

Table 4.M Register Addresses to Read Datalinks

Register Address	Description	Detail
10025	Datalink A1 Out	Lo Word
10026		Hi Word
10027	Datalink A2 Out	Lo Word
10028		Hi Word
10029	Datalink B1 Out	Lo Word
10030		Hi Word
10031	Datalink B2 Out	Lo Word
10032		Hi Word
10033	Datalink C1 Out	Lo Word
10034		Hi Word
10035	Datalink C2 Out	Lo Word
10036		Hi Word
10037	Datalink D1 Out	Lo Word
10038		Hi Word
10039	Datalink D2 Out	Lo Word
10040		Hi Word

All 16-bit parameter values will appear in the Lo Word of an assigned Datalink Out.

Writing Datalinks

Use the register addresses in Table 4.N to write to Datalinks using Function Code 16 or 23.

Table 4.N Register Addresses to Write Datalinks

Register Address	Description	Detail
10005	Datalink A1 In	Lo Word
10006		Hi Word
10007	Datalink A2 In	Lo Word
10008		Hi Word
10009	Datalink B1 In	Lo Word
10010		Hi Word
10011	Datalink B2 In	Lo Word
10012		Hi Word
10013	Datalink C1 In	Lo Word
10014		Hi Word
10015	Datalink C2 In	Lo Word
10016		Hi Word
10017	Datalink D1 In	Lo Word
10018		Hi Word
10019	Datalink D2 In	Lo Word
10020		Hi Word

Any Datalink In can also be read using Function Code 03 or 23.

32-Bit Parameters using 16-Bit Datalinks

This subsection pertains to VTAC 9 drives which use 16-bit Datalinks. To read (and/or write) a 32-bit parameter using 16-bit Datalinks, typically both Datalinks of a pair (A, B, C, D) are set to the same 32-bit parameter. For example, to read Parameter 010 - [Elapsed Run Time] in a VTAC 9 drive, both Datalink A1 Out and Datalink A2 Out are set to "10." Datalink A1 Out will contain the least significant word (LSW) and Datalink A2 Out will contain the most significant word (MSW).

32-bit data is stored in binary as follows:

MSW	2^{31} through 2^{16}
LSW	2^{15} through 2^{0}

In this example, the Parameter 10 - [Elapsed Run Time] value of 6553.9 Hrs is read as “6553.9” in Datalink A1 Out and Datalink A2 Out.

Register Address	Datalink	Word	Parameter	Data (Hex)
10025	A1 Out	LSW	10	0003
10026				0000
10027	A2 Out	MSW	10	0001
10028				0000

Conversion Example:

Parameter 010 - [Elapsed Run Time] = 6553.9 Hrs
MSW = $0001_{hex} = 0001_{binary} = 2^{16} = 65536$
LSW = $0003_{hex} = 3$
Engineering Value = 65536 + 3 = 65539
Parameter 10 Displayed Value = 6553.9 Hrs

Regardless of the Datalink combination, Datalink x1 Out will always contain the LSW and Datalink x2 Out will always contain the MSW. In the following example, the VTAC 9 drive Parameter 242 - [Power Up Marker] contains a value of 88.4541 Hrs.

Modbus Address	Datalink	Word	Parameter	Data (Hex)
10027	A2 Out	MSW	242	000D
10028				0000
10029	B1 Out	LSW	242	7F3D
10030				0000

Conversion Example:

Parameter 242 - [Power Up Marker] = 88.4541 hours
MSW = $000D_{hex} = 1101_{binary} = 2^{19} + 2^{18} + 2^{16} = 851968$
LSW = $7F3D_{hex} = 32573$
Engineering Value = 851968 + 32573 = 884541
Parameter 242 Displayed Value = 88.4541 Hrs

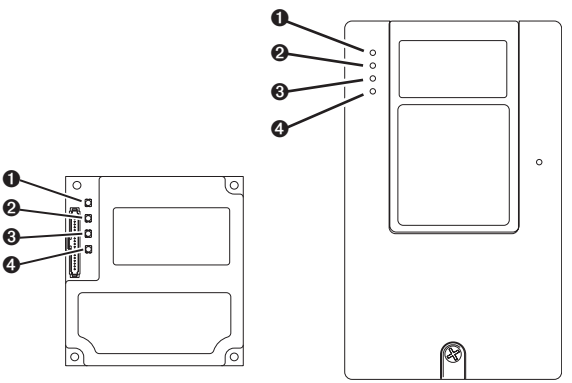
Troubleshooting

This chapter provides information for diagnosing and troubleshooting potential problems with the module.

Understanding the Status Indicators

The module has four status indicators. They can be viewed on the module or through the drive cover. See Figure 5.1.

Figure 5.1 Status Indicators (location on drive may vary)



Item	Status Indicator	Description	Page
❶	Drive	DPI Connection Status	5-2
❷	MS	Module Status	5-3
❸	NET A	Modbus/TCP Connection Status	5-4
❹	NET B	Modbus/TCP Transmit Status	5-5

Drive Status Indicator

Status	Cause	Corrective Action
Off	The module is not powered or is not properly connected to the drive.	• Securely connect the module to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive.
Flashing Red	The module is not receiving a ping message from the drive.	• Verify that cables are securely connected and not damaged. Replace cables if necessary. • Cycle power to the drive.
Solid Red	The drive has refused an I/O connection from the module. Another DPI peripheral is using the same DPI port as the module.	**Important:** Cycle power to the drive after making any of the following corrections: • Verify that all DPI cables on the drive are securely connected and not damaged. Replace cables if necessary. • Verify that the DPI drive supports Datalinks. • Configure the module to use a Datalink that is not already being used by another peripheral.
Orange	The module is connected to a product that does not support Rockwell Automation DPI communications.	Connect the module to a product that supports DPI communications (for example, a VTAC 9 drive).
Flashing Green	The module is establishing an I/O connection to the drive.	No action required. Normal behavior if no DPI I/O is enabled.
Solid Green	The module is properly connected and is communicating with the drive.	No action required.

MS Status Indicator

Status	Cause	Corrective Action
Off	The module is not powered or is not properly connected to the drive.	• Securely connect the module to the drive using the Internal Interface (ribbon) cable. • Apply power to the drive.
Flashing Red	The module has failed the firmware test. The module is being flash upgraded.	• Clear faults in the module. • Cycle power to the drive. • If cycling power does not correct the problem, the parameter settings may have been corrupted. Reset defaults and reconfigure the module. • If resetting defaults does not correct the problem, flash the module with the latest firmware release.
Solid Red	The module has failed the hardware test.	• Cycle power to the drive. • Replace the module.
Flashing Green	The module is operational, but is not transferring I/O data.	• Verify that the controller can send messages to the module. • Normal behavior if no DPI I/O is enabled.
Solid Green	The module is operational and transferring I/O data.	No action required.

NET A Status Indicator

Status	Cause	Corrective Actions
Off	The module and/or network is not powered, the module is not properly connected to the network, or the module needs an IP address.	• Securely connect the module to the drive using the Internal Interface (ribbon) cable and to the network using an Ethernet cable. • Correctly connect the Ethernet cable to the Ethernet connector. • Set a unique IP address using a BOOTP server or by disabling BOOTP and using module parameters. • Apply power to the drive and network.
Solid Red	The module failed the duplicate IP address detection test.	Configure the module to use a unique IP address and cycle power.
Flashing Red	The Modbus/TCP connection has timed out.	Clear the fault on the drive and change **Parameter 19 - [Msg I/O Timer]** to a higher value or to zero (0) to disable Modbus/TCP connection timeouts.
Flashing Red/Green	The module is performing a self-test.	No action required.
Flashing Green	The module is properly connected but is not communicating with any devices on the network.	• Verify that the controller can send messages to the module. • Create an I/O connection with the module by sending it Modbus/TCP messages.
Solid Green	The module is properly connected and communicating on the network.	No action required.

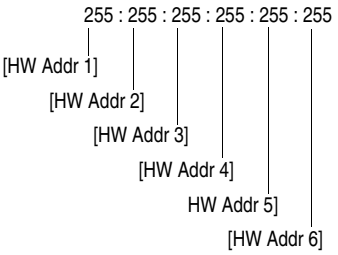
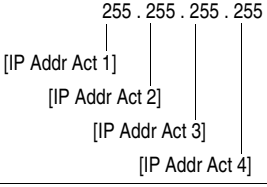
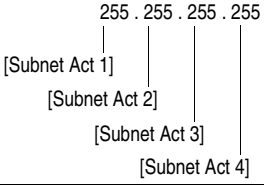
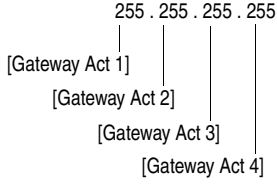
NET B Status Indicator

Status	Cause	Corrective Actions
Off	The module is not powered or is not transmitting on the network.	If NET A is off: • Securely connect the module to the drive using the Internal Interface (ribbon) cable and to the network using an Ethernet cable. • Correctly connect the Ethernet cable to the Ethernet connector. • Set a unique IP address using a BOOTP server or by disabling BOOTP and using module parameters. If NET A is flashing red/green or red: • Check the IP address in the module and verify that the controller can communicate with the module. • Ping the module. Normal condition if the module is idle.
Flashing Green	The module is transmitting on the network.	No action required.

Viewing Module Diagnostic Items

If you encounter unexpected communications problems, the module's diagnostic items may help you or Rockwell Automation personnel troubleshoot the problem. The following module diagnostic items can be viewed using an LCD OIM or VS Utilities (version 3.01 or higher) software.

No.	Name	Description
1	DPI Common Command	The present value of the Common Logic Command being transmitted to the drive by this module.
2	DPI Product Command	The present value of the Product Logic Command being transmitted to the drive by this module.
3	Reference	The present value of the Reference being transmitted to the drive by this module. If the drive indicates a 16-bit Reference size, the Reference value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of the diagnostic item are zero (0).
4	DPI Common Status	The present value of the Common Logic Status being received from the drive by this module.
5	DPI Product Status	The present value of the Product Logic Status being received from the drive by this module.
6	Feedback	The present value of the Feedback being received from the drive by this module. If the drive indicates a 16-bit Feedback size, the Feedback value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of the diagnostic item are zero (0).
7	Datalink A1 In	The present value of respective Datalink In being transmitted to the drive by this module. If not using a Datalink, this parameter should have a value of zero (0). If the drive indicates a 16-bit Datalink size, the Datalink value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of the diagnostic item are zero (0).
8	Datalink A2 In	
9	Datalink B1 In	
10	Datalink B2 In	
11	Datalink C1 In	
12	Datalink C2 In	
13	Datalink D1 In	
14	Datalink D2 In	
15	Datalink A1 Out	The present value of respective Datalink Out being received from the drive by this module. If the drive indicates a 16-bit datalink size, the Datalink value appears in the least significant 16 bits of this diagnostic item, and the most significant 16 bits of this diagnostic item are zero (0).
16	Datalink A2 Out	
17	Datalink B1 Out	
18	Datalink B2 Out	
19	Datalink C1 Out	
20	Datalink C2 Out	
21	Datalink D1 Out	
22	Datalink D2 Out	
23	DPI Rx Errors	The present value of the DPI CAN Receive Error Counter register.
24	DPI Rx Error Max	The maximum value (since reset) of the DPI Receive Error Counter register.
25	DPI Tx Errors	The present value of the DPI CAN Transmit Error Counter register.
26	DPI Tx Error Max	The maximum value (since reset) of the DPI Transmit Error Counter register.
27	Boot Flash Count	Number of times the boot firmware in the module has been flash updated.
28	App Flash Count	Number of times the application firmware in the module has been flash updated.

No.	Name	Description
29 30 31 32 33 34	HW Addr 1 HW Addr 2 HW Addr 3 HW Addr 4 HW Addr 5 HW Addr 6	Decimal value of each byte in the module's Ethernet hardware address. 
35 36 37 38	IP Addr Act 1 IP Addr Act 2 IP Addr Act 3 IP Addr Act 4	Value of each byte in the module's present IP address. A value of "0" appears if the module does not presently have an IP address. 
39 40 41 42	Subnet Act 1 Subnet Act 2 Subnet Act 3 Subnet Act 4	Value of each byte in the module's present subnet mask. A value of "0" appears if the module does not presently have a subnet mask. 
43 44 45 46	Gateway Act 1 Gateway Act 2 Gateway Act 3 Gateway Act 4	Value of each byte in the module's present gateway address. A value of "0" appears if the module does not presently have a gateway address. 
47	EN Rx Overruns	Number of receive buffer overruns reported by the Ethernet hardware.
48	EN Rx Packets	Number of receive packets that the module has received.
49	EN Rx Errors	Number of receive errors reported by the Ethernet hardware.
50	EN Tx Packets	Number of transmit packets that the module has sent.
51	EN Tx Errors	Number of transmit errors reported by the Ethernet hardware.

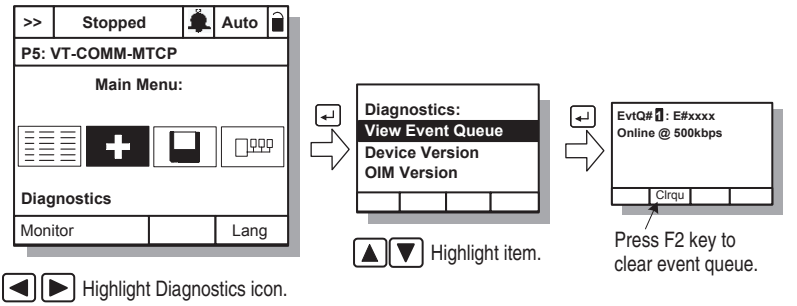
Viewing and Clearing Events

The module maintains an event queue that reports the history of its actions. You can view the event queue using an LCD OIM or VS Utilities (3.01 or higher) software.

To View and Clear Events

Use the procedure shown in Figure 5.2 to access the event queue using the LCD OIM. Note that you must have the VT-COMM-MTCP module as the selected device to access its event queue.

Figure 5.2 Viewing and Clearing Events Using an LCD OIM



Events

Many events in the event queue occur under normal operation. If you encounter unexpected communications problems, the events may help you or Rockwell Automation personnel troubleshoot the problem. The following events may appear in the event queue:

Code	Event	Description
1	No Event	Empty event queue entry.
2	DPI Bus Off Flt	A bus-off condition was detected on DPI. This event may be caused by loose or broken cables or by noise.
3	Ping Time Flt	A ping message was not received on DPI within the specified time.
4	Port ID Flt	The module is not connected to a correct port on a DPI product.
5	Port Change Flt	The DPI port changed.
6	Host Sent Reset	The drive sent a reset event message.
7	EEPROM Sum Flt	The EEPROM in the module is corrupt.
8	Online @ 125kbps	The module detected that the drive is communicating at 125 kbps.
9	Online @ 500kbps	The module detected that the drive is communicating at 500 kbps.

Code	Event	Description
10	Bad Host Flt	The module was connected to an incompatible product.
11	Dup Port Flt	Another peripheral with the same port number is already in use.
12	Type 0 Login	The module has logged in for type 0 control.
13	Type 0 Time Flt	The module has not received a type 0 status message within the specified time.
14	DL Login	The module has logged into a Datalink.
15	DL Reject Flt	The drive rejected an attempt to log in to a Datalink because the Datalink is not supported or is used by another peripheral.
16	DL Time Flt	The module has not received a Datalink message within the specified time.
17	Reserved	Not used.
18	Control Disabled	The module has sent a “Soft Control Disable” command to the drive.
19	Control Enabled	The module has sent a “Soft Control Enable” command to the drive.
20	Message Timeout	A Client-Server message sent by the module was not completed.
21	Flt Cfg Error	At least one of the Flt Cfg xx parameters is set to a value greater than 65535 and the drive requires a 16-bit value.
22	App Updated	Startup sequence detected new application firmware.
23	EN Comm Flt	The module detected a communications fault on the network.
24	EN Sent Reset	The module received a reset from the network.
25	EN Close Flt	An I/O connection from the network to the module was closed.
26	EN Idle Flt	The module is receiving “Idle” packets from the network.
27	EN Open	An I/O connection to the module from the network has been opened.
28	EN Timeout Flt	An I/O connection from the network to the module has timed out.
29	PCCC IO Close	The device sending PCCC control messages to the module has set the PCCC Control Timeout to a value of zero.
30	PCCC IO Open	The module has begun receiving PCCC control messages (the PCCC Control Timeout was previously set to a non-zero value).
31	PCCC IO Time Flt	The module has not received a PCCC control message within the specified PCCC Control Timeout interval.
32	Watchdog T/O Flt	The software detects a failure.
33	EEPROM Init	Startup sequence detected a blank EEPROM map revision. Intended to happen in factory test.
34	Normal Startup	The module successfully started up.
35	Manual Reset	The module was reset by changing Parameter 22 - [Reset Module].
36	EN Link Down	The Ethernet link was removed from the module.
37	EN Link Up	An Ethernet link is available for the module.
38	BOOTP Response	The module received a response to its BOOTP request.
39	Dup IP Addr	The module uses the same IP address as another device on the network.
40	Reserved	Not used.
41	Reserved	Not used.
42	Email Failed	Module encountered an error attempting to send a requested e-mail message.
43	Reserved	Not used.
44	Reserved	Not used.
45	Reserved	Not used.
46	Reserved	Not used.
47	Reserved	Not used.
48	Reserved	Not used.

Notes:

Viewing the Module's Web Pages

This chapter provides instructions on how to monitor the module and connected VTAC 9 drive using the module's web interface.

Future enhancements may result in module web pages that look different than the examples shown in this chapter.

Accessing the Module's Web Home Page

After configuring the module, you can view its web pages. These pages present information about the module, the drive to which it is connected, and the other DPI devices connected to the drive such as an OIM.

By default the module web pages are disabled. To enable the web pages, set the Web Pages Switch (SW2 in Figure 2.1) to its "Enable Web" position and reset the module. **Parameter 36 - [Web Enable]** can be used to display the setting (Enabled or Disabled) of this switch.

The module can be configured to automatically send e-mail messages to desired addresses when selected drive faults occur and/or are cleared, and/or when the module takes a communication fault action.

Bit 0 of **Parameter 37 - [Web Features]** can be used to protect the configured settings. For more details, see the Configure E-mail Notification Web Page on page 6-6.

Viewing the Web Pages of the Module

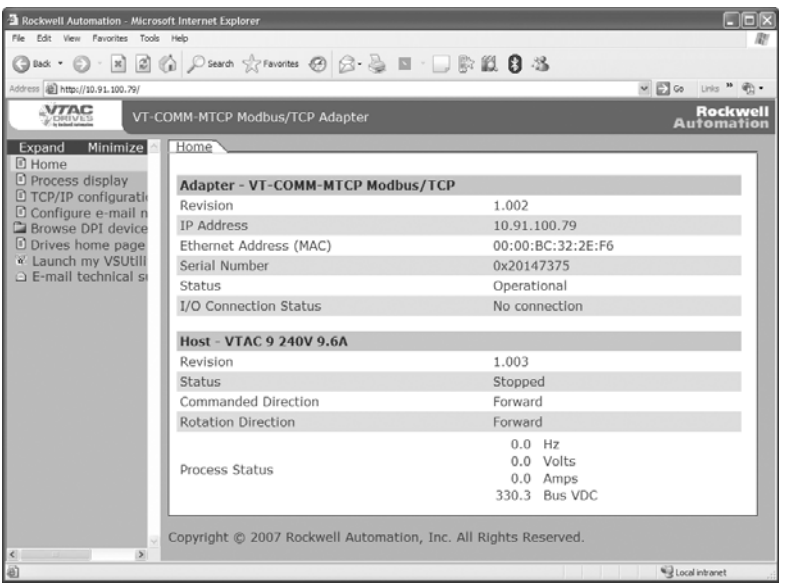
1. On a computer with access to the Modbus/TCP network on which the module is installed, launch a web browser such as Microsoft™ Internet Explorer (version 5.0 or greater).

   The computer can access the module web pages if it is connected to the same network as the module, or if it is connected to a network with access to the module's network via a gateway device (for example, a router).

2. In the Explorer Address box, type the IP address of the module, and then press ENTER. The module web Home Page (Figure 6.1) appears.

   Important: Clicking the browser's Refresh button always re-displays the Home Page even while viewing another module web page.

Figure 6.1 Module Web Home Page Example



Title Bar on Module Web Pages

The title bar appears on all module web pages, including its Home Page. It consists of three elements:

Title Bar Element	Description
VTAC logo (at far left)	This logo is also a link. Click it to view the VTAC web Home Page.
Module Title (middle)	Shows the module type or user-configurable title.
Rockwell Automation logo (at far right)	This logo is also a link. Click it to view the Rockwell Automation web Home Page.

Navigation Menu on Module Web Pages

The navigation menu appears on the left side of all module web pages, including its Home page. The navigation menu consists of links and link folders which can be expanded or minimized. The following table shows all of the navigation menu links and link folders:

Link/Folder	Description
Home link	Click this link to view the module's Home Page (Figure 6.1).
Process display link	Click this link to view the Host's Process Display pop-up window (Figure 6.2)
TCP/IP configuration link	Click this link to view the module's TCP/IP Configuration web page showing information about the TCP/IP configuration, such as the module's IP address and the number of packets being sent. Figure 6.3 shows an example TCP/IP Configuration web page.
Configure e-mail notification link	Click this link to view the module's Configure E-mail Notification web page (Figure 6.4) to configure the module to send automatic e-mail messages. E-mail notification can accommodate specific needs such as when only selected faults occur (Figure 6.5). An example e-mail message is shown in Figure 6.6.
Browse DPI devices folder	Click this folder to expand and view the Port folders for all present DPI devices, including the drive, module, and other DPI devices connected to the drive such as an OIM.
Port x folders	Click a respective Port folder to expand and view its device's various links which take you to related information pages. For Port 0 (VTAC 9 Drive) example information pages, see Figure 6.7, Figure 6.8, and Figure 6.9.
Drives home page link	Click this link to view the VTAC web Home Page.
Launch my VS Utilities software link	Click this link to launch the VS Utilities software already installed on your PC.
E-mail technical support link	Click this link to view a new e-mail message window to send a message to VTAC's Technical Support Team.

Information on Module Home Page

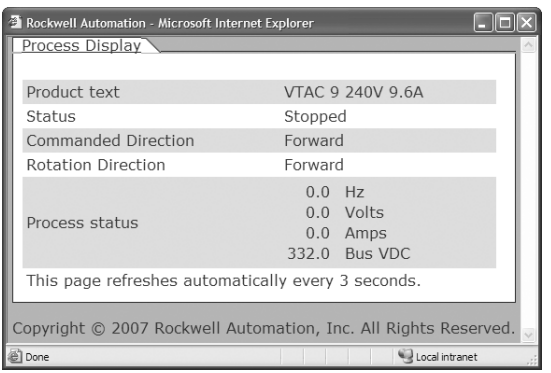
The module Home Page displays the following information for the module and host:

Information for	Description	
Module	• Revision • IP Address • Ethernet Address (MAC)	• Serial Number • Status • I/O Connection Status
Host "X"	• Revision • Status • Commanded Direction	• Rotation Direction • Process Status

Process Display Pop-up Window

The Process Display pop-up window dynamically shows a host's information. To view this window, click the "Process Display" link in the navigation menu.

Figure 6.2 Example of Process Display Pop-up Window



Information	Description
Product Text	Description of host drive.
Status	Status of host drive.
Commanded Direction	Commanded direction of host drive.
Rotation Direction	Rotation direction of host drive.
Process Status	Line 1 – desired parameter of host and its dynamic value. (1) Line 2 – desired parameter of host and its dynamic value. (2) Line 3 – desired parameter of host and its dynamic value. (2) Line 4 – desired parameter of host and its dynamic value. (2)

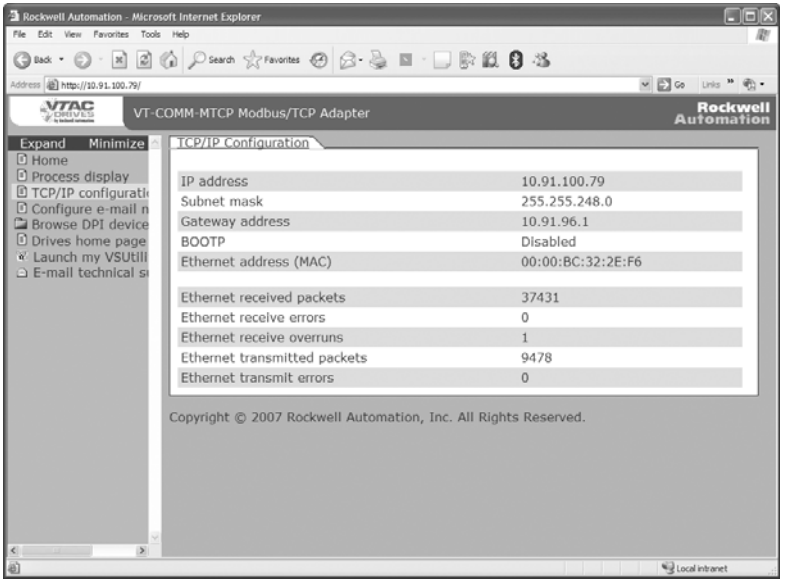
(1) The parameter whose value is shown on this line is the feedback value from the drive, and is not selectable.

(2) The parameter whose value is shown on this line can be set by using the OIM. For details, see the drive User Manual.

TCP/IP Configuration Web Page

The TCP/IP Configuration web page provides information about the module's Ethernet settings and network activities.

Figure 6.3 Example of TCP/IP Configuration Web Page



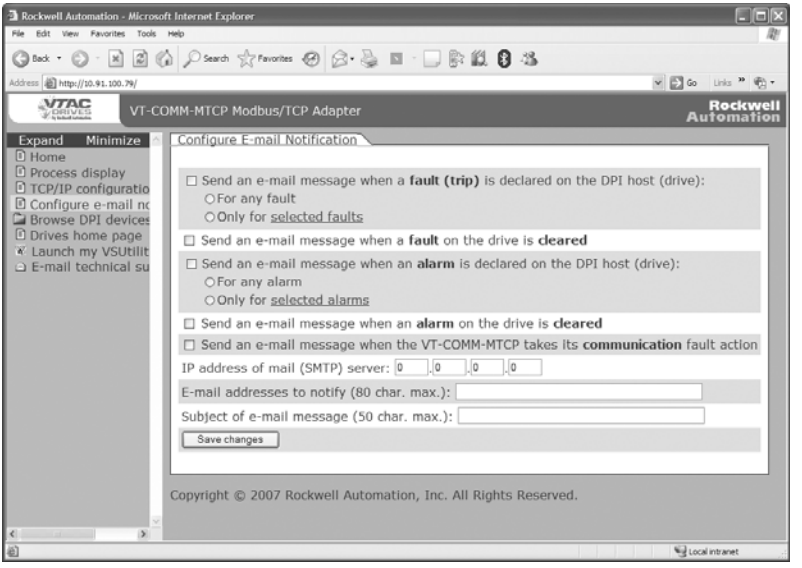
Information	Description
IP Address	IP address of the module.
Subnet Mask	Subnet mask for the module's network.
Gateway Address	Address for the gateway device on the module's network.
BOOTP	Whether BOOTP is being used to configure the module's network information.
Ethernet Address (MAC)	Hardware address for the module.
Ethernet Received Packets	Number of packets that the module has received.
Ethernet Receive Errors	Number of receive errors reported by the hardware.
Ethernet Receive Overruns	Number of receive buffer overruns reported by the hardware.
Ethernet Transmitted Packets	Number of packets that the module has sent.
Ethernet Transmit Errors	Number of transmit errors reported by the hardware.

Configure E-mail Notification Web Page

The Configure E-mail Notification web page contains selections and data fields for configuring the module to automatically send e-mail messages to desired addresses when selected types of events occur.

By default, settings are not protected. After configuration, settings can be protected by using **Parameter 37 - [Web Features]** to set E-mail Cfg Bit 0 value to "0" (Disabled). To change a protected configuration, it must first be unprotected by setting the E-mail Cfg Bit 0 value back to "1" (Enabled).

Figure 6.4 Example of Configure E-mail Notification Web Page



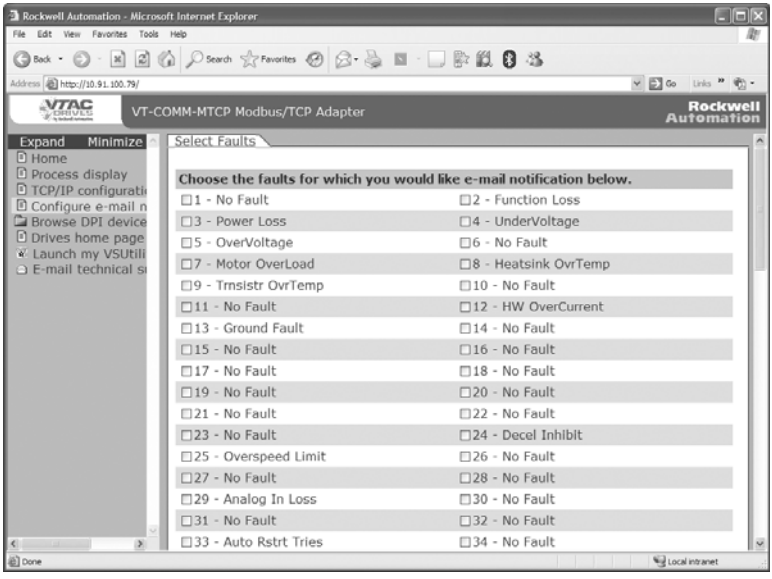
Configuring E-mail Notification

1. Click the desired "Send an e-mail message when…" check boxes you want to occur that will send e-mail notification. If you only want e-mail notification when selected faults/alarms occur:

   A. Click the respective fault and/or alarm radio buttons.

   B. Click the "selected faults" link and/or "selected alarms" link. Figure 6.5 shows an example faults configuration page.

Figure 6.5 Example of Selected Faults Configuration Page



C. Click the desired fault/alarm check boxes, and click **Save Changes**.

D. Click the "Back to E-mail Configuration Page" link.

2. Type the following information in their respective boxes:

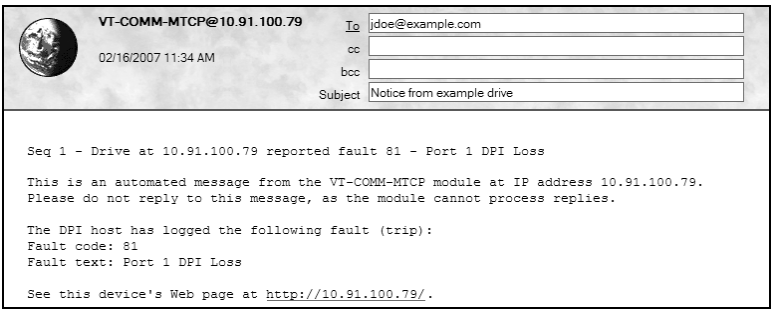
Information	Description
"IP address of…"	Type in the address of the mail server that will be used to deliver the e-mail messages.
"E-mail addresses to notify…"	Type in addresses to where you want e-mail messages to be sent. Multiple addresses can be used, but they must be separated by commas (comma delimited).
"Subject of e-mail message…"	Type in the desired subject text for the e-mail message.

3. Click **Save changes**.

Important: After configuring E-mail Notification, it is recommended to protect the settings. Otherwise the configuration can be changed anytime the web page is accessed with a browser. Use **Parameter 37 - [Web Features]** to set E-mail Cfg Bit 0 value to "0" (Disabled) to protect the settings.

Figure 6.6 shows an example e-mail message automatically sent by the module in response to selected events.

Figure 6.6 Example of E-mail Message Sent by Module



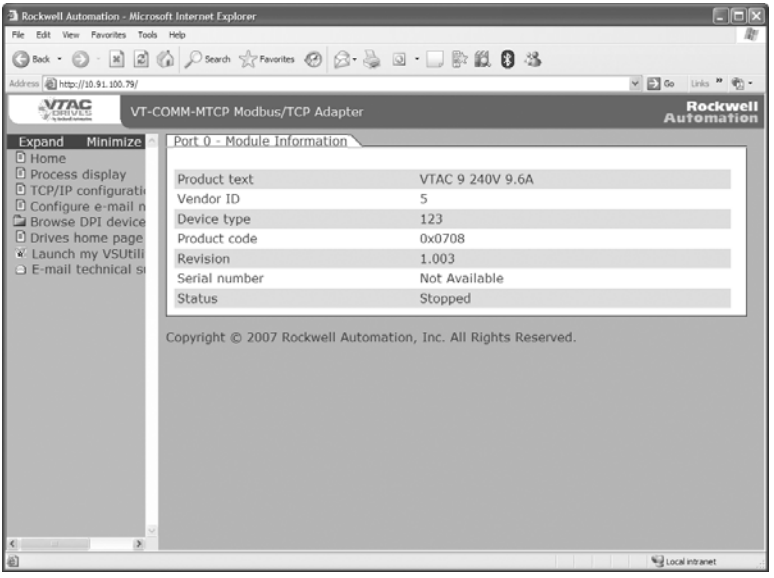
TIP: To stop e-mail messages, uncheck all of the "Send an e-mail message when…" boxes.

Disabling the module web pages by setting the Web Pages Switch (SW2 in Figure 2.1) to the "Disable Web" position will NOT stop the module from sending e-mail messages.

DPI Device Information Pages

DPI device information pages show a device's module information, diagnostic items, fault queue, event queue, and alarm queue. Figure 6.7 shows an example module information page for the Port 0 device (host). Figure 6.8, Figure 6.9, and Figure 6.10 respectively show example diagnostic items, fault queue, and alarm queue pages for this device.

Figure 6.7 Example of Port 0 (VTAC 9 Drive) Module Information Page



Information	Description
Product Text	Text identifying the device
Vendor ID	5 = VTAC
Device Type	123
Product Code	Code for the product name and its rating
Revision	Firmware revision used by the device
Serial Number	Serial number of the device
Status	Operating status of the device (for example, faulted)

Figure 6.8 Example of Port 0 (VTAC 9 Drive) Diagnostic Items Page

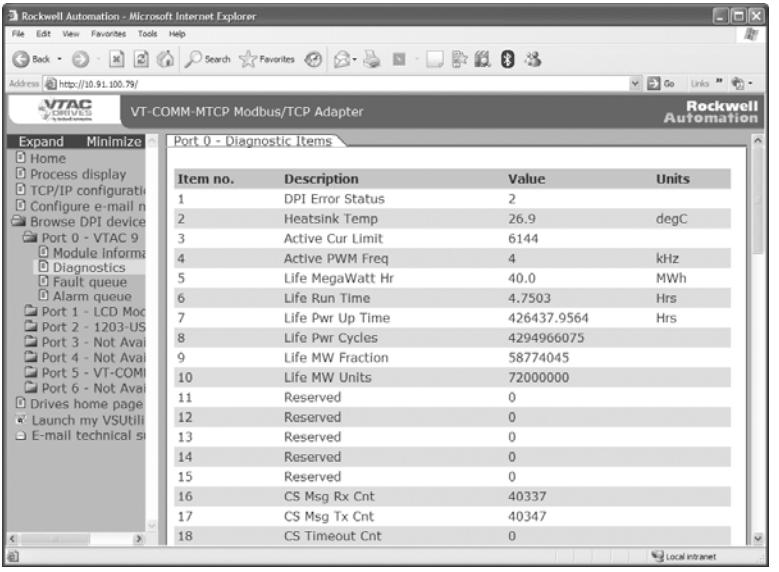
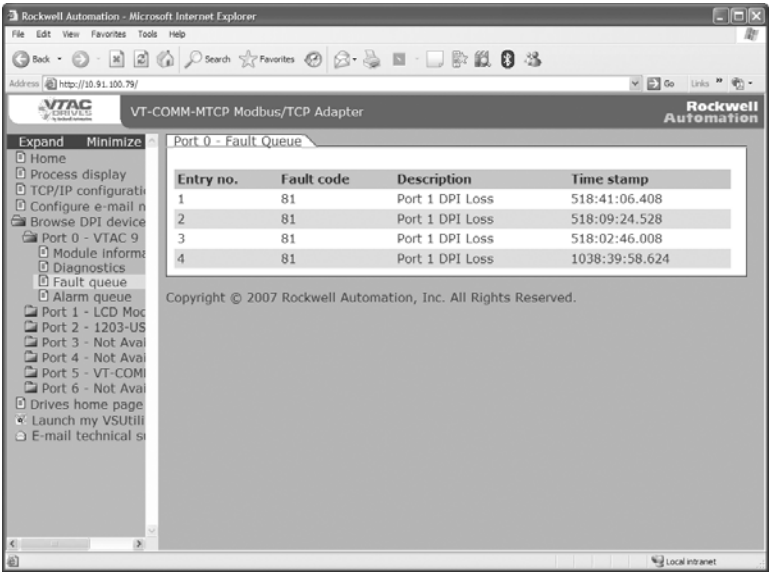


Figure 6.9 Example of Port 0 (VTAC 9 Drive) Fault Queue Page



For drives that do not support an alarm queue, the module will still display an alarm queue web page (Figure 6.10) showing that the queue is not available.

Figure 6.10 Example of Port 0 (VTAC 9 Drive) Alarm Queue Page

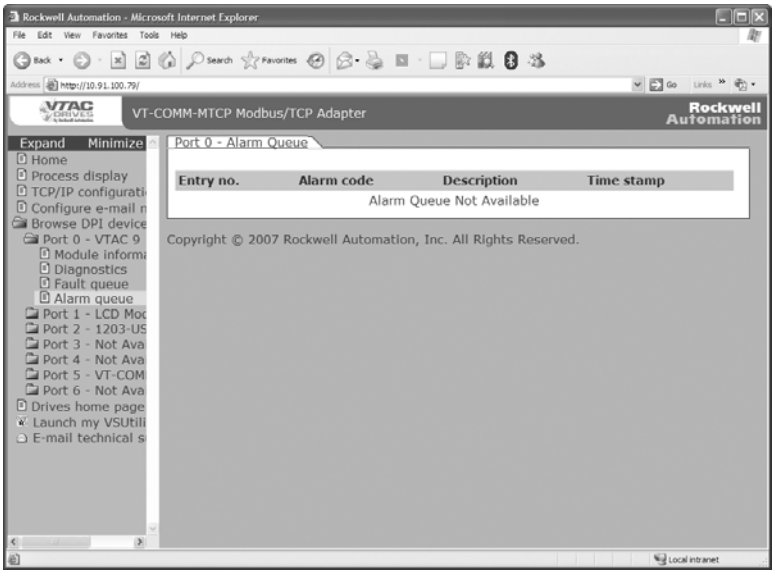
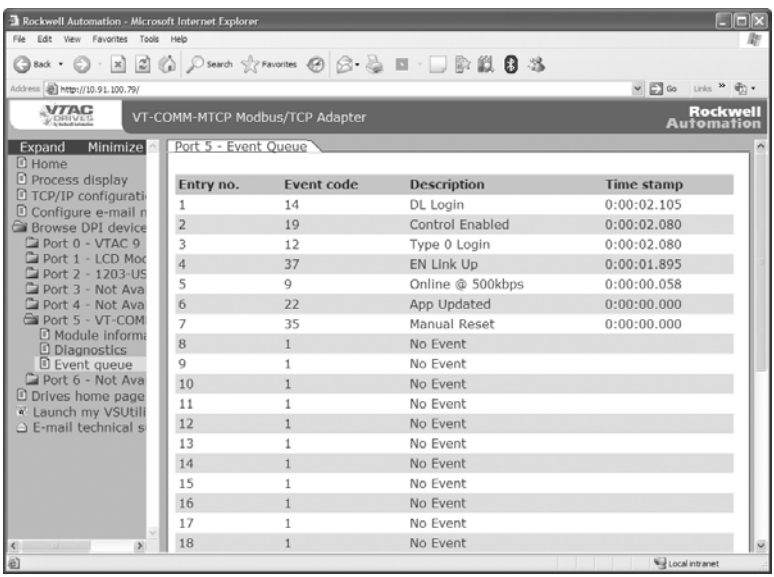


Figure 6.11 shows an example event queue page for the Port 5 device (VT-COMM-MTCP module).

Figure 6.11 Example of Port 5 (VT-COMM-MTCP Module) Event Queue Page



Notes:

Specifications

Appendix A presents the specifications for the module.

Communications

Network	
Protocol	Modbus/TCP
Data Rates	10 Mbps Full Duplex, 10 Mbps Half Duplex, 100 Mbps Full Duplex, or 100 Mbps Half Duplex
Drive	
Protocol	DPI
Data Rates	125 kbps or 500 kbps

Electrical

Consumption	
Drive	350 mA at 5 VDC supplied by the host (for example, drive)
Network	None

Mechanical

Dimensions	
Height	19 mm (0.75 inches)
Length	86 mm (3.39 inches)
Width	78.5 mm (3.09 inches)
Weight	85g (3 oz.)

Environmental

Temperature Operating Storage	 -10 to 50°C (14 to 122°F) -40 to 85°C (-40 to 185°F)
Relative Humidity	5 to 95% non-condensing
Atmosphere	**Important:** The module **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the module is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.

Regulatory Compliance

UL	UL508C
cUL	CAN / CSA C22.2 No. 14-M91
CE	EN50178 and EN61800-3
CTick	EN61800-3

NOTE: This is a product of category C2 according to IEC 61800-3. In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

Module Parameters

Appendix B provides information about the Modbus/TCP module parameters.

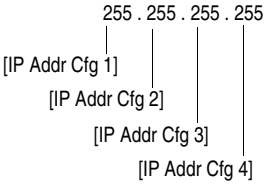
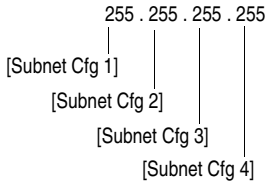
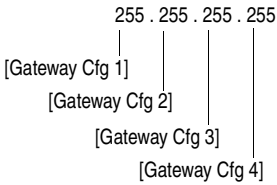
About Parameter Numbers

The parameters in the module are numbered consecutively. However, depending on which configuration tool you use, they may have different numbers.

Configuration Tool	Numbering Scheme
• OIM • VS Utilities	The module parameters begin with parameter 01. For example, Parameter 01 - [DPI Port] is parameter 01 as indicated by this manual.
• Explicit Messaging	Refer to Chapter 4, Using Modbus/TCP Function Codes for details.

Parameter List

Parameter No.	Name and Description	Details	
01	**[DPI Port]** Displays the port to which the module is connected. This will usually be port 5.	Default: Minimum: Maximum: Type:	5 0 7 Read Only
02	**[DPI Data Rate]** Displays the data rate used by the drive. This data rate is set in the drive, and the module detects it.	Default: Values: Type:	0 = 125 kbps 0 = 125 kbps 1 = 500 kbps Read Only
03	**[BOOTP]** Configures the module to use BOOTP so that you can set its IP address, subnet mask, and gateway address with a BOOTP server.	Default: Values: Type: Reset Required:	1 = Enabled 0 = Disabled 1 = Enabled Read/Write Yes

Parameter No.	Name and Description	Details
04 05 06 07	**[IP Addr Cfg 1]** **[IP Addr Cfg 2]** **[IP Addr Cfg 3]** **[IP Addr Cfg 4]** Sets the bytes in the IP address.  **Important:** To set the IP address using these parameters, **Parameter 03 - [BOOTP]** must be set to Disabled.	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes
08 09 10 11	**[Subnet Cfg 1]** **[Subnet Cfg 2]** **[Subnet Cfg 3]** **[Subnet Cfg 4]** Sets the bytes of the subnet mask.  **Important:** To set the subnet mask using these parameters, **Parameter 03 - [BOOTP]** must be set to Disabled.	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes
12 13 14 15	**[Gateway Cfg 1]** **[Gateway Cfg 2]** **[Gateway Cfg 3]** **[Gateway Cfg 4]** Sets the bytes of the gateway address.  **Important:** To set the gateway address using these parameters, **Parameter 03 - [BOOTP]** must be set to Disabled.	Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 255 Type: Read/Write Reset Required: Yes

Parameter No.	Name and Description	Details	
16	**[EN Rate Cfg]** Sets the network data rate at which the module communicates. (Updates **Parameter 17 - [EN Rate Act]** after reset.)	Default: Values Type: Reset Required:	0 = Autodetect 0 = Autodetect 1 = 10 Mbps Full 2 = 10 Mbps Half 3 = 100 Mbps Full 4 = 100 Mbps Half Read/Write Yes
17	**[EN Rate Act]** Displays the actual network data rate being used by the module.	Default: Values Type:	0 = No Link 0 = No Link 1 = 10 Mbps Full 2 = 10 Mbps Half 3 = 100 Mbps Full 4 = 100 Mbps Half Read Only
18	**[Modbus/TCP Port]** Sets the TCP port used to transport Modbus/TCP messages.	Default: Minimum: Maximum: Type: Reset Required:	502 0 65535 Read/Write Yes
19	**[Msg I/O Timer]** Sets the communication loss timeout period in seconds. The value zero disables this feature.	Default: Minimum: Maximum: Type:	5 seconds 0 seconds 180 seconds Read/Write
	ATTENTION: Risk of injury or equipment damage exists. **Parameter 19 - [Msg I/O Timer]** lets you determine how long it will take the module to detect network communication losses. By default, this parameter sets the timeout to five (5) seconds. You can set it so that the duration is shorter, longer, or disabled. When set to disabled, this also disables module **Parameter 23 - [Comm Flt Action]**. Therefore, a communication fault action will be ignored. Take precautions to ensure that the setting does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).		
20	**[Ref/Fdbk Size]** Displays the size of the Reference/Feedback. The drive determines the size of the Reference/ Feedback.	Default: Values: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only
21	**[Datalink Size]** Displays the size of each Datalink word. The drive determines the size of Datalinks.	Default: Values: Type:	0 = 16-bit 0 = 16-bit 1 = 32-bit Read Only
22	**[Reset Module]** No action if set to “Ready.” Resets the module if set to “Reset Module.” Restores the module to its factory default settings if set to “Set Defaults.” This parameter is a command. It will be reset to “0 = Ready” after the command has been performed.	Default: Values Type: Reset Required:	0 = Ready 0 = Ready 1 = Reset Module 2 = Set Defaults Read/Write No
	ATTENTION: Risk of injury or equipment damage exists. If the module is transmitting I/O that controls the drive, the drive may fault when you reset the module. Determine how your drive will respond before resetting a connected module.		

Parameter No.	Name and Description	Details
23	**[Comm Flt Action]** Sets the action that the module and drive will take if the module detects that network communications have been disrupted. This setting is effective only if I/O that controls the drive is transmitted through the module.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last 4 = Send Flt Cfg Type: Read/Write Reset Required: No

ATTENTION: Risk of injury or equipment damage exists. **Parameter 23 - [Comm Flt Action]** lets you determine the action of the module and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

24	**[DPI I/O Cfg]** Sets the I/O that is transferred through the module.	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read/Write Reset Required: Yes

Bit Definition	Not Used	Not Used	Not Used	Datalink D	Datalink C	Datalink B	Datalink A	Cmd/Ref
Default	x	x	x	0	0	0	0	1
Bit	7	6	5	4	3	2	1	0

25	**[DPI I/O Act]** Displays the I/O that the module is actively transmitting. The value of this parameter will usually be equal to the value of **Parameter 24 - [DPI I/O Cfg]**.	Default: xxx0 0001 Bit Values: 0 = I/O disabled 1 = I/O enabled Type: Read Only

Bit Definition	Not Used	Not Used	Not Used	Datalink D	Datalink C	Datalink B	Datalink A	Cmd/Ref
Default	x	x	x	0	0	0	0	1
Bit	7	6	5	4	3	2	1	0

26	**[Flt Cfg Logic]** Sets the Logic Command data that is sent to the drive if **Parameter 23 - [Comm Flt Action]** is set to “Send Flt Cfg” and communications are disrupted. The bit definitions will depend on the product to which the module is connected. See the documentation for the drive being used.	Default: 0000 0000 0000 0000 Minimum: 0000 0000 0000 0000 Maximum: 1111 1111 1111 1111 Type: Read/Write Reset Required: No

Parameter No.	Name and Description	Details
27	**[Flt Cfg Ref]** Sets the Reference data that is sent to the drive if **Parameter 23 - [Comm Flt Action]** is set to "Send Flt Cfg" and communications are disrupted.	Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses a 16-bit Reference, the most significant word of this value must be set to zero (0) or a fault will occur.
28 29 30 31 32 33 34 35	**[Flt Cfg A1 In]** **[Flt Cfg A2 In]** **[Flt Cfg B1 In]** **[Flt Cfg B2 In]** **[Flt Cfg C1 In]** **[Flt Cfg C2 In]** **[Flt Cfg D1 In]** **[Flt Cfg D2 In]** Sets the data that is sent to the Datalink in the drive if **Parameter 23 - [Comm Flt Action]** is set to "Send Flt Cfg" and communications are disrupted.	Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read/Write Reset Required: No **Important:** If the drive uses 16-bit Datalinks, the most significant word of this value must be set to zero (0) or a fault will occur.
36	**[Web Enable]** Displays the setting of the Web Pages Switch (SW2) on the module when the module was last reset.	Default: 0 = Disabled Minimum: 0 = Disabled Maximum: 1 = Enabled Type: Read Only
37	**[Web Features]** Sets the access to the Web interface and Web-configurable features.	Default: xxxx xxx1 Bit Values: 0 = Disabled 1 = Enabled Type: Read/Write Reset Required: No

Bit Definition	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	E-mail Cfg
Default	x	x	x	x	x	x	x	1
Bit	7	6	5	4	3	2	1	0

Parameter No.	Name and Description	Details	
38	**[Indirect Par #1]**	Default:	0
39	**[Indirect Par #2]**	Default:	0
40	**[Indirect Par #3]**	Default:	0
41	**[Indirect Par #4]**	Default:	0
42	**[Indirect Par #5]**	Default:	0
43	**[Indirect Par #6]**	Default:	0
44	**[Indirect Par #7]**	Default:	0
45	**[Indirect Par #8]**	Default:	0
46	**[Indirect Par #9]**	Default:	0
47	**[Indirect Par #10]**	Default:	0
48	**[Indirect Par #11]**	Default:	0
49	**[Indirect Par #12]**	Default:	0
50	**[Indirect Par #13]**	Default:	0
51	**[Indirect Par #14]**	Default:	0
52	**[Indirect Par #15]**	Default:	0
53	**[Indirect Par #16]**	Default:	0
	Sets the Indirect Parameter value used to point to a device parameter (drive or any of its connected peripherals) to read or write values with specific Modbus Function Codes. For details to use these module Indirect Parameters, see Indirect Access Method on page 4-11.	Minimum: Maximum: Type: Reset Required:	0 16999 Read/Write No

B

BOOTP (Bootstrap Protocol)

BOOTP lets the module configure itself dynamically at boot time if the network has a BOOTP server. The BOOTP server assigns the module a preconfigured IP address, a subnet mask, and a gateway address; therefore, you do not have to configure these using the parameters in the module. BOOTP can make it easier to administer an Ethernet network. A free version of Rockwell Software's BOOTP Server can be accessed at http://www.ab.com/networks/bootp.html.

C

CAN (Controller Area Network)

CAN is a serial bus protocol on which DPI is based.

Controller

A controller, also called programmable logic controller, is a solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory.

D

Data Rate

The data rate is the speed at which data is transferred on the Modbus/TCP network.

You can set the module to a data rate of 10 Mbps Full-Duplex, 10 Mbps Half-Duplex, 100 Mbps Full-Duplex, or 100 Mbps Half-Duplex. If another device on the network sets or auto-negotiates the data rate, you can set the module to automatically detect the data rate.

Datalinks

A Datalink is a type of pointer used by VTAC 9 drives to transfer data to and from the controller. Datalinks allow specified parameter value(s) to be accessed or changed without using explicit messages. When enabled, each Datalink consumes either four bytes or eight bytes in both the input and output image table of the controller. The drive determines the size of Datalinks.

DPI (Drive Peripheral Interface)

DPI is a second generation peripheral communication interface used by various VTAC drives, such as VTAC 9 drives.

DPI Peripheral

A device that provides an interface between DPI and a network or user. Peripheral devices are also referred to as “modules” or “adapters.” The VT-COMM-MTCP module, RECOMM-232 converter, and LCD OIMs are examples of DPI peripherals.

DPI Product

A device that uses the DPI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a VTAC 9 drive is a DPI product. In this manual, a DPI product is also referred to as “drive” or “host.”

Duplex

Duplex describes the mode of communication. *Full-duplex* communications let a device exchange data in both directions at the same time. *Half-duplex* communications let a device exchange data only in one direction at a time. The duplex used by the module depends on the type of duplex that other network devices, such as switches, support.

F

Fault Action

Determines how the module and connected drive act when a communications fault occurs (for example, a cable is disconnected).

Fault Configuration

When communication is disrupted (for example, a cable is disconnected), the module and drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive using specific fault configuration parameters in the module. When a fault action parameter is set to use the fault configuration data and a fault occurs, the data from these parameters is sent as the Logic Command, Reference, and/or Datalink(s).

Flash Update

The process of updating firmware in a device. The module can be flash updated using VS Utilities software (version 3.01 or higher).

G

Gateway

A gateway is a device on a network that connects an individual network to a system of networks. When a node needs to communicate with a node on another network, a gateway transfers the data between the two networks. You need to configure the address for the gateway device in the module if you want the module to communicate with devices that are not on its network.

H

Hardware Address

Each Ethernet device has a unique hardware address (sometimes called a MAC address) that is 48 bits. The address appears as six digits separated by colons (for example, xx:xx:xx:xx:xx:xx). Each digit has a value between 0 and 255 (0x00 and 0xFF). This address is assigned in the hardware and cannot be changed. It is required to identify the device if you are using a BOOTP utility.

Hold Last

When communications are disrupted (for example, a cable is disconnected), the module and drive can respond by holding last. Hold last results in the drive receiving the last data received via the network connection before the disruption. If the drive was running and using the Reference from the module, it will continue to run at the same Reference.

I

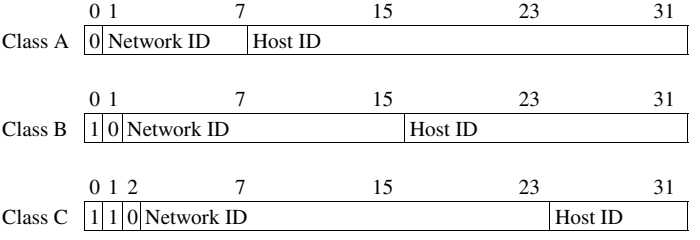
I/O Data

I/O data, sometimes called " implicit messages" or "input/output," transmit time-critical data such as a Logic Command and Reference. The terms "input" and "output" are defined from the controller's point of view. Output is produced by the controller and consumed by the module. Input is produced by the module and consumed by the controller.

IP Addresses

A unique IP address identifies each node on a Modbus/TCP network. An IP address consists of 32 bits that are divided into four segments of one byte each. It appears as four decimal integers separated by periods (xxx.xxx.xxx.xxx). Each "xxx" can have a decimal value from 0 to 255. For example, an IP address could be 192.168.0.1.

An IP address has two parts: a network ID and a host ID. The class of network determines the format of the address.



The number of devices on your Modbus/TCP network will vary depending on the number of bytes that are used for the network address. In many cases you are given a network with a Class C address, in which

the first three bytes contain the network address (subnet mask = 255.255.255.0). This leaves 8 bits or 256 addresses on your network. Because two addresses are reserved for special uses (0 is an address for the network usually used by the router, and 255 is an address for broadcast messages to all network devices), you have 254 addresses to use on a Class C address block.

To ensure that each device on the Internet has a unique address, contact your network administrator or Internet Service Provider for unique fixed IP addresses. You can then set the unique IP address for the module by using a BOOTP server or by manually configuring parameters in the module. The module reads the values of these parameters only at power-up.

L

Logic Command/Logic Status

The Logic Command is used to control the VTAC 9 drive (for example, start, stop, direction). It consists of one 16-bit word of output to the module from the network. The definitions of the bits in this word depend on the drive.

The Logic Status is used to monitor the VTAC 9 drive (for example, operating state, motor direction). It consists of one 16-bit word of input from the module to the network. The definitions of the bits in this word depend on the drive.

M

Modbus/TCP Network

Modbus/TCP is an open network designed for use in industrial environments. Modbus/TCP allows industrial devices to perform control, configuration, and monitoring tasks using standard Ethernet IEEE 802.3 equipment, the TCP/IP protocol, and the Modbus/TCP protocol. Modbus/TCP by itself, as with any Ethernet-based protocol, does not address control determinism issues, though they can be minimized by network design and the use of commercial network switches.

Module

Devices such as drives, controllers, and computers usually require a module to provide a communication interface between them and a network such as Modbus/TCP. A module reads data on the network and transmits it to the connected device. It also reads data in the device and transmits it to the network.

The VT-COMM-MTCP Modbus/TCP module connects a VTAC 9 drive to a Modbus/TCP network. Modules are sometimes also called “cards,”

"embedded communication options," "gateways," "adapters," and "peripherals."

N

NVS (Non-Volatile Storage)

NVS is the permanent memory of a device. Devices such as the module and drive store parameters and other information in NVS so that they are not lost when the device loses power. NVS is sometimes called "EEPROM."

0

OIM (Operator Interface Module)

A device that can be used to configure and control a drive. VTAC 9 OIMs can be used to configure VTAC 9 drives and connected peripherals.

P

PCCC (Programmable Controller Communications Commands)

PCCC is the protocol used by some controllers to communicate with devices on a network. Some software products (for example, VS Utilities) also use PCCC to communicate.

Ping

A message that is sent by a DPI product to its peripheral devices. They use the ping to gather data about the product, including whether it can receive messages and whether they can log in for control. On Ethernet, a ping can be used to determine if a node exists.

R

Reference/Feedback

The Reference is used to send a setpoint (for example, speed, frequency, torque) to the drive. It consists of one word of output to the module from the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

Feedback is used to monitor the speed of the drive. It consists of one word of input from the module to the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

S

Status Indicators

Status indicators are LEDs that are used to report the status of the module, network, and drive. They are on the module and can be viewed on the front cover of the drive when the drive is powered.

Subnet Mask

A subnet mask is an extension to the IP addressing scheme that lets you use a single network ID for multiple physical networks. A bit mask identifies the part of the address that specifies the network and the part of the address that specifies the unique node on the network. A “1” in the subnet mask indicates the bit is used to specify the network. A “0” in the subnet mask indicates that the bit is used to specify the node.

For example, a subnet mask on a Class C address may appear as follows: 11111111 11111111 11111111 11000000 (255.255.255.192). This mask indicates that 26 bits are used to identify the network and 6 bits are used to identify devices on each network. Instead of a single physical Class C network with 254 devices, this subnet mask divides it into four networks with up to 62 devices each.

Switches

Switches are network devices that provide virtual connections that help to control collisions and reduce traffic on the network. They are able to reduce network congestion by transmitting packets to an individual port only if they are destined for the connected device. In a control application, in which real time data access is critical, network switches may be required in place of hubs.

T

TCP (Transmission Control Protocol)

Modbus/TCP uses this protocol to transfer packets using IP. TCP guarantees delivery of data through the use of retries.

V

VS Utilities Software

VS Utilities software is a tool for monitoring and configuring VTAC drives and modules. It can be run on computers running various Microsoft Windows operating systems. VS Utilities (version 3.xx or higher) can be used to configure this module and VTAC 9 drives. Information about VS Utilities software can be accessed at http://www.vtacdrives.com.

Z

Zero Data

When communications are disrupted (for example, a cable is disconnected), the module and drive can respond with zero data. Zero data results in the drive receiving zero as values for Logic Command, Reference, and Datalink data. If the drive was running and using the Reference from the module, it will stay running but at zero Reference.

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